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IMPROVEMENT OF MISSOURI RIVER.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

A communication from the Chief of Engineers, enclosing reports respecting the improvement of the Missouri river.

FEBRUARY 1 1868.—Referred to the Committee on Commerce and ordered to be printed.

WAR DEPARTMENT,

Washington City, January 30, 1868.

SIR: I have the honor to send herewith a communication of January 30, 1868, from the Chief of Engineers, with reports by Colonel Macomb and Major Howell, of the corps of engineers, respecting the improvement of the Missouri river, made in compliance with the act of March 2, 1867, making appropriations for the repair, preservation, &c., of certain public works.

Your obedient servant,

EDWIN M. STANTON,

Secretary of War.

HON. SCHUYLER COLFAX,

Speaker of the House of Representatives.

HEADQUARTERS CORPS OF ENGINEERS,

Washington, D. C., January 30, 1868.

SIR: In obedience to the requirements of the act making appropriations for the repair, preservation, and completion of certain public works, heretofore commenced under the authority of law, and for other purposes, approved March 2, 1867, I have the honor to transmit herewith the report of Colonel J. N. Macomb, corps of engineers, with the accompanying report of his assistant, Brevet Major C. W. Howell, corps of engineers, on the improvement of the Missouri river.

The views and recommendations of the report are concurred in.

The amount of funds on hand, and that estimated for in the annual report of the Chief of Engineers for the next fiscal year, will suffice for the removal of snags in the river between its mouth and Fort Randall during the period estimated for.

IMPROVEMENT OF MISSOURI RIVER.

For the improvement of the upper portion between the mouth of the Muscle Shell river and Fort Benton there will be required a further appropriation of \$60,000.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,

Brigadier General of Engineers, Commanding.

Hon. E. M. STANTON,

Secretary of War.

MISSOURI RIVER.

OFFICE OF WESTERN RIVER IMPROVEMENTS,

Cincinnati, Ohio, January 14, 1868.

GENERAL: I beg leave to lay before you the very able and interesting report of my assistant, Brevet Major C. W. Howell, captain of engineers, upon the condition of the Missouri river, and his plans and estimates for improving the same, which I heartily approve, and trust that he may be allowed to carry out.

It will be seen from this report that there is an immense field of operations of more or less uncertainty as to the permanency of the improvement, although evidently very necessary to be undertaken, in the way of removing snags. This part of the work it is expected to commence with one of our snag-boats, now in the course of completion; whilst on the upper waters there is an opportunity and a demand for some work of a more definite and permanent character of improvement in clearing the channel of boulders and making some rock dams.

Major Howell's estimate for a suitable light-draught steamer, with requisite boilers, engines, tools, and machinery for the part of the work last al-	
luded to.....	\$29,000
And for wages, &c., of crew for working the same, together with fuel,	
&c., for five months.....	23,900

Amounting to.....	52,900
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The money now remaining applicable to the Missouri river will afford ample means for defraying the above expense for the first season's work, and the future carrying on of the work would be the subject of new estimates made with the aid of the experience gained in working the boat above estimated for.

As regards the work of snagging on the Missouri, the expense of that is included in my annual estimates submitted on the 19th September, 1867.

Should this report and recommendation meet with your approval, I beg to be authorized, as soon as possible, to advertise for proposals for building, equipping and furnishing, complete, at some convenient point on the Ohio river, such a light-draught steamer as is indicated in the general description given in the report.

The maps in progress for illustrating this report will be invaluable to the engineer officer in charge of the party in the field to be improved, and it is expected to take tracing of them here on that account.

I remain, very respectfully, your most obedient servant,

J. N. MACOMB,

Colonel Engineers, Brevet Colonel U. S. A.

Brevet Major General A. A. HUMPHREYS,

Brig. Gen. Com'dg Corps of Engineers U. S. A.,

Headquarters, Washington, D. C.

OFFICE WESTERN RIVER IMPROVEMENTS,
Cincinnati, Ohio, June 24, 1867.

SIR: You will proceed, without delay, to St. Louis, Missouri, and from that city, by river, to Fort Benton, for the purpose of inspecting the condition of the Missouri river, with a view to its improvement.

You are authorized to employ one (1) assistant to accompany you, and make as complete and accurate a sketch of the river as practicable, to illustrate your report.

On completion of this duty you will return to Cincinnati, and make to this office a detailed report, in writing, embracing all information of importance you may have gained.

You will pay particular attention to the obstructions in the river, including snags, bars, and rapids, and report on the feasibility of removing them, together with approximate estimates of time, labor, machinery, and expense, necessary to render navigation more safe and speedy.

I remain, very respectfully, your obedient servant,

J. N. MACOMB,

Colonel Engineers, Brevet Colonel U. S. A.

Brevet Major C. W. HOWELL,

Captain of Engineers U. S. A.

OFFICE WESTERN RIVER IMPROVEMENTS,
Cincinnati, Ohio, December 3, 1867.

COLONEL: In continuation of the duties designated in your order dated June 24, 1867, I have the honor to submit the following report.

The maps and sketches intended to accompany this report are not yet completed, but will be forwarded the latter part of February, 1868.

I have the honor to be, sir, very respectfully, your obedient servant,

C. W. HOWELL,

Captain Engineers, Brevet Major U. S. A.

Colonel JOHN N. MACOMB,

Corps of Engineers U. S. A.

REPORT.

The Missouri river, owing to the rapidity of its current and the geological characteristics of its immediate valley, is at all times, after leaving the highlands four hundred miles below Fort Benton, a wide and comparatively shallow stream.

The average velocity of its current has been estimated at three miles per hour, and that is very greatly increased, during the flood season, in contracted portions of the river, frequently reaching five or six miles per hour, and forcing the most powerful steamers to use the towing-line.

The immediate valley of the river presents the same general characteristics throughout the greater part of its length. The stream winds through a narrow bottom of light alluvial formation, closely shut in by high rounded hills or rolling table lands, cushioning the bends and throwing the current from side to side across the valley. A luxuriant growth of cottonwood, interspersed at points with ash, elm, plum, and cherry, covers the most fertile portions of the bottom, while dense willow thickets fringe the lower banks and creep out upon the long sand points and high bars.

The barren plateaus which often intervene between the bottoms and the base

of the hills support but a scanty covering of coarse, short prairie grass and stunted sage brush, and the short narrow ravines furnish a straggling growth of pine and cedar.

These characteristics, though generally pertaining, are greatly modified in that portion of the valley below Fort Randall, at which point the bottom lands begin to widen and increase in fertility, and civilization adds its changes to the general features of the country. Cottonwood groves continue to hold their places on the lower grounds, but the hillsides gradually exchange their nakedness for a valuable covering of oak, hickory and walnut.

The light, loosely aggregate character of the bottom formation renders it peculiarly susceptible to the action of the current, which at all stages of the river eats its way into exposed banks and fills the channel with the debris.

Even the more substantial bluffs are not exempt from the encroachments of the river when in flood, being subject by their non-homogeneous formation to the undermining action of the current, which washes away the layers of drift and precipitates the rock into the channel, always at such points running close in shore.

From the Round Butte to St. Louis, every bend of the river gives more or less emphatic evidence of this cutting action, the bed of the river at peculiarly susceptible points shifting in a few weeks from 200 to 300 yards into the bottom lands, and frequently cutting through the necks of bends, changes the whole channel for miles on either side.

The disproportion between the current velocity and the stability of the banks causes the obstructed condition of the lower river. During the height of the flood season, but more particularly at a medium stage, the current cuts material from the bank faster than it can remove and arrange it; the water, already charged to the extent of its carrying power, rolls the surplus along the bottom, fills up the low water channel, and evenly raises the river bed throughout its length and breadth; as the river falls below its medium height, work is gradually transferred from the bank to this accumulation of sand and mud upon the bottom, the two are sorted by the current, the mud carried away and deposited in the stiller portions of the stream to form the top-dressing of a willow bar or bottom, and the sand, left without its seductive influence, is shifted from place to place by the erratic efforts of the water while accommodating itself to a channel. In consequence, the whole bed of the river is choked by shifting sand-bars, giving one day a good channel and the next changing so as to obstruct the whole water-way; every change in the stage of the river, and every modification in the shape of its banks, either by cutting or filling, changes the direction of the current and forces a corresponding change in the sand deposits, so that these latter are never at rest, since the causes of disturbance continue throughout the year.

In addition to these sand obstructions others of a more dangerous character are formed, due to the same cause. By the caving in of timbered banks great numbers of cottonwood trees are precipitated into the stream, filling it with drift and snags. Trees washed in by the higher stages are generally carried to a distance before they are deposited; their roots are washed clear of earth; they are in consequence less liable to anchor in the bed of the river, and the majority of such are drifted on the bars and sand bottoms, where they dry and form the drift of succeeding floods.

Drift, though at times dangerous, has its use, and the benefit derived from it in those stretches of the river where firewood is scarce, more than counterbalances the risk of broken wheels and rudders, or the breaking of a few planks in a weak hull.

Snags, on the contrary, are useless and extremely dangerous. They are to be found in every bend of the river, solitary or in clusters, standing out boldly above the surface of the water, or lurking beneath it with but a ripple on top to warn the pilot of their presence; some have grown gray and lame-like in their

stations, while others, new comers, retain their limbs and stretch widely across the channel.

No portion of the river bed in the vicinity of timbered bottoms is without its snags; the newest are near the bank, the oldest have passed in turn across the channel and into the opposite growing point.

The most dangerous are those old settlers in the crossings, where each season, as the channel shifts back and forth, they lie alternately in the channel or buried in the sand. The ice of each spring freshet during a series of years has added to their sharpness and curtailed their length until many of them only reach above the surface at low water; no pilot can tell their exact position, and to strike them is almost certain destruction. Many of them lie buried for years before the channel cuts around them; their place has passed from the memory of even those best acquainted with the river, and their presence is only manifested by the disaster they cause.

The new comers are the least dangerous of snags; they are only troublesome; they block the channel along freshly cut banks and cause delay, but in time as the bank cuts more and more they are thinned out by the ice and by freshets, leaving the more stubborn to settle in the bars and wait the shifting of the channel to become in their turn dangerous.

In determining what snags ought to be removed to improve navigation only long experience should be consulted, and even that may often mislead. A cutting bank is always a good guide where the bends are deep and regular, for the channel usually runs close to it, but in long stretches or where islands divide the stream only an experienced pilot accustomed to the river can tell where to clear the way. No certain estimate of the dimensions of a snag can be based on its showing above water; its inclination, and the depth of water around it, may, in the majority of cases, give an idea of its length, but not with certainty. Many small appearing snags are but the limbs of large trees imbedded in the sand, while those showing large diameters vary from twenty to a hundred feet in length.

It will be safe to premise that all snags come from large trees, for only they have sufficient root to give a firm anchorage.

Rock obstructions occur wherever rocky bluffs border the stream, but not in troublesome numbers until entering the rapid section of the river. A few disasters have occurred from their presence in the lower and middle river, but all from want of thorough pilots. Obstructions of this kind hold their place; do not occur where the channel is liable to shift, and for this reason can always be avoided with proper care and knowledge.

The rapids properly begin at Two-Calf island, and are obstructed by rocky reefs, or, as in the majority of cases, by boulders congregated so as to partially dam the stream, rendering the channel tortuous and difficult. All of the rapids, even at low water, have a sufficient depth of water over the channel bed to carry boats adapted to the mountain trade, provided the channel be cleared of obstructions, and several of the minor island chutes closed so as to throw the water into the main channel.

Throughout the rapids section the river bed is subject to but slight change; the channel does not shift; the water is free from sediment; the banks cut but very little, and are sparsely timbered; snags but seldom occur, and the bars, all of gravel, are permanent.

Between the rapids the channel gives from three to ten feet water, and although studded with boulders is perfectly safe when run with care. Between Two-Calf island and Fort Benton there are fifteen rapids more or less difficult, the principal of which are Cow island, Snake Point, Dauphin's, Drowned Man's, and Maria's. Should these five be well cleared navigation will be insured until the 1st of October each season. The other rapids are simply difficult, not im-

passable at any season; they are known as Two-Calf, Bird, Bear, Lone Pine, Holmes, Pablos Nos. 1, 2 and 3 and Kiddes.

The rapids are the only points above Fort Randall warranting improvement. That their improvement is of importance will be clearly proven by reference to the appended commercial statistics. The expense of improvement will be fully repaid the government in a single year by decreased rates of freight incident to increased safety and certainty of navigation, and by dispensing with expensive wagon transportation from Cow island. The improvements necessary will be of the simplest kind, as shown by the following description and annexed sketches:

Two-Calf island is at the foot of the rapid section. At this point the river is divided into three parts by two small islands, the greatest depth of water being found in the right and middle chutes, each about forty (40) yards in width, and giving from three to six feet water. The middle chute, which is now the navigable channel, branches from the right-hand chute below the head of the larger island, and re-enters it before uniting with the left chute below. The water is deflected from its natural direction and thrown into this middle channel by a rocky bar formed across the right chute by the washings of a large ravine. Should this bar be removed and its cause guarded, the bulk of the stream would naturally seek the right shore, and make a safe, deep and permanent channel through the right chute, completely closing the middle one.

The middle chute branches from the right at such an obtuse angle that boats are obliged to send a hawser ahead, both in passing up and returning, to prevent being drawn on the bar and damaged. The left channel is never used, except in high water.

To improve this point, I propose the removal of the bar in the right chute, and that a boulder dam be thrown across the ravine one hundred yards above its mouth to detain future drift from that quarter. Owing to want of time, my observations were not sufficiently minute to warrant detailed estimates of time and labor required to make the proposed improvement, but approximate estimates will be found appended with sketch.

In passing up, the next point worthy of improvement is the crossing at the head of Grand island. This is obstructed by a gravel bar, extending across the main channel from Grand island to the foot of a small island above, and giving but thirty inches in the crossing. About one-fourth of the water is diverted from the natural channel by the two island chutes. If these were closed, a fair channel three feet deep would be cut through the bar, and the troublesome suck through the Grand Island chute removed. The present crossing is very square, and, after sparring over the bar, boats are liable to swing into the head of the chute and ground, as did the steamers Minor and Only Chance on their second trip this season.

At Cow island the river is again divided into three channels, the principal of these following the left shore and giving three, four, and five feet water off the rocks. The only obstructions are loose boulders, irregularly distributed over the bottom, and rendered troublesome by the rapidity of the current.

To improve these rapids it will only be necessary to clear a direct channel through these boulders, so that boats may keep head to the current in going up. With time, further improvement might be made by closing the right chute, by which the left channel will be considerably deepened.

At Snake Point a ledge of rocks, with boulders lodged upon it, starting from the left shore, runs obliquely across the channel to the lower right-hand shore, having near its centre a gap wide enough and deep enough for the passage of boats, but infested with boulders, and oblique to the current, so that boats passing up are not only in danger of striking boulders in the gap, but are also in danger of swinging on the reef below. In passing down there is yet greater danger, and it is usual to drop through with bow and stern lines. By clearing

the gap of boulders the channel will be made as good as in other portions of the river.

At Bird, Bear, and Lone Pine rapids, a few boulders might be removed to the great benefit of those points, but I would not recommend work on them until more troublesome points are improved, since they can be safely passed, with proper care, at all seasons of the year when the other rapids are passable.

Dauphin's rapids, the highest point on which I can report from present inspection, is considered the most difficult of the series of rapids. It is the first to become impassable, and, except in very favorable seasons, is the terminus of the second trip of the season. But one boat of the mountain fleet passed it on the second trip this year, and she only succeeded after clearing a number of rocks from the channel and sustaining very considerable injury about her hull. The river is here obstructed by a rocky chain across the channel, with loose boulders lodged above and below.

As with the other rapids, the plan of improvement proposed contemplates clearing a direct channel through these boulders, and blasting through the reef. At the head of the rapids a small island divides the current, and both chutes have been used by boats, but, from the best of my observation, the channel along the left shore is best adapted to improvement, and may have all the water thrown into it by damming the right chute at the head of the island. By improving only this one point, two trips from St. Louis to Benton will be insured to the regular mountain fleet each year.

Of those rapids above I can only report on information derived from others. Drowned Man's, and the rapids near the mouth of the Maria's river, are considered the only points of real difficulty after leaving Dauphin's, and they are only represented as obstructed by boulders which, when removed, will leave a good channel.

To effect the improvements above recommended to be made in the rapid section of the river, I would propose the building of a boat specially adapted to the service. A small side-wheel steamer, with strong engine, and draught not to exceed eighteen inches, strongly built forward to sustain a derrick capable of lifting ten tons, to be used in removing loose rocks; to be provided with tools for drilling rocks, and materials for blasting; to carry a crew of from fifteen to twenty able-bodied, intelligent men, and to be otherwise equipped as the most approved steamers of the mountain fleet. I annex details of a suitable steamer, drawn up and recommended by Mr. E. M. Shield, with estimate of cost of construction and working. With the steamer and crew proposed, all the necessary improvements can be made in a single season of three months, beginning on the first of July and ending the first of October, and at an expense much less than would be warranted by the importance of the work.

In consideration of the vastness of the work, even should it be deemed desirable, I would not recommend an attempt to clear the river of snags above Fort Randall. The vastly greater importance of the lower river, and its more obstructed condition, calls for thorough and speedy attention, and is deserving of all the efforts that can be made to clear it. The yearly loss in this portion of the river, from snags alone, averages half a million dollars, and injures the spirit of river enterprise to a much more serious extent. With two of the snag-boats now in process of construction the channel may be thoroughly cleared of those dangerous obstructions in a single season, from Randall to St. Louis.

The season favorable for operations begins about the middle of July and continues until the middle of October, after which the river becomes so low that navigation is practically suspended for all except steamers of the lightest draught. For probable expense of a single season's operations I refer to annexed estimate.

Owing to the changeable nature of the river bed, and the continual additions of fresh deposits from cutting banks, it will be necessary to employ one boat during each season for a number of years on this duty, after which work may

be suspended for a time, but must be resumed at intervals of a few years so long as the importance of river transportation will warrant the expense.

As might be expected from the character of the river, a great number of wrecks lie sunken in this lower section, but the great majority of them, at present, are not in the way, and pilots are familiar with their positions. Many of them have been partially removed by the underwriters, leaving but the hull and wheels, so that the labor of clearing them out of the channel has been greatly simplified. I would recommend the employment of the steamer Patten during the months of August and September, 1868, in the removal of those deemed dangerous or likely to become so.

To free the river from the troublesome sand bars which choke and complicate its channel for a distance of 2,500 miles, although practicable, would yet involve an outlay not warranted by the present importance of the stream. It would be necessary to protect the banks for that distance from the cutting action of the current, and to so confine the water-way as to give a constant channel. This is, of course, not contemplated, and may never be deemed advisable.

Boats must clear their own way in the future, as they have done in the past, but with better machinery. The old system of sparring, though generally achieving its purpose, is yet too clumsy, and is at times inefficient. A machine for ploughing through bars might be made as effective as the snow plough in use on our railroads, and even more effective, for the material of bars is of that kind easily moved by the current, and when slightly disturbed is quickly rolled away by the rush of water past the bows of a vessel. In sparring, advantage is taken of this instability of sand bars. The forward part of the boat is lifted bodily upon the bar, pushed forward by the engines, and allowed to settle down upon the sand; the current rapidly washes underneath the hull, and the operation is repeated as fast as the spars can be taken up and reset. This mode is tedious, and dependent on the height of the bar and velocity of the current; but with ordinary bars, though slow, is successful when properly directed.

A light ploughing machine in front of each boat, with strong engines to push the vessel ahead, would be more effective, more expeditious, less expensive, and less cumbersome, involving less wear and tear of tackle and avoiding racking the hull.

This important item in the economy of the river is found in abundance between St. Louis and Fort Randall, ready cut and dried for use. Wood-yards are at convenient intervals, and prices reasonable. From Randall to Fort Buford fire-wood is scarce, although green timber exists in reasonable quantity. Boats depend for the greater part of their supply upon the drift found lodged upon points and bottoms; nomadic wood-choppers occasionally appear, but their tenure is too precarious for dependence, and steamers receive but little benefit from their service.

Above Fort Buford and until entering the rapid section, wood is abundant; large cottonwood deadenings presenting themselves at short intervals and making excellent wadding stations.

The commerce of the Missouri, although not equal to the natural demands of the country dependant upon it, is steadily increasing in importance, and will continue its growth to meet the necessities of our northern territories, as their resources are developed and navigation is rendered more safe and speedy. At present the commerce above the rapids is concentrated at the two points, Camp Cook and Fort Benton, the former receiving only army and sutlers' supplies for the military post established there, and the latter receiving supplies for the mining country of Montana, for the military posts of Fort Benton and Sun river, and for the northern Indians. During the season of 1867, forty-three steamboats engaged in this trade cleared from the port of St. Louis; of these, one made two round trips; two on the second trip were unable to pass Dauphin's rapids, and left their freight at Cow island; one on the first trip could

get no higher than Fort Hawley; and the steamer Imperial on the first trip discharged freight at Cow island, and is now on her return, last reported November 20, at St. Joseph, with three hundred passengers and a large consignment of specie; the J. H. Prover was wrecked at Point au Poche; the Nora sunk near De Sols; the Deer Lodge had her shaft broken by drift near Decatur, and gave up her second trip.

Of the freight carried by this fleet, 2,095 tons belonged to government and 5,966 tons to private parties, making a total of 8,061 tons, dependent on the navigation of the rapid section of the river. Of the return cargoes I can give but little information; hides, peltries, gold, silver, and copper, are the only exports, and all seek river transportation.

It is safe to say that five-sixths of the mining products of Montana reach the east by way of the Missouri river. The passenger traffic is also an item of considerable importance, and it is estimated that 10,000 persons during this season have taken this route to and from Montana, at an average rate of \$150 each, making a total of \$1,500,000 for payment of passages. It is not expected that the river will in the future be the passenger route to Montana, for the reason that the trip can be made in much shorter time by the way of the Union Pacific railroad and stage to the mines. Indian troubles may influence a few travellers, but the great majority will naturally seek the shortest and most speedy route, with its attendant risks. Travel from Montana in the spring and summer will, however, be by the river, the boats then being able to compete successfully in point of time with the stage route, besides furnishing a safer and more pleasant mode of travelling.

Nor does the river at present enjoy a monopoly of the Montana trade, owing to the high rate of river transportation, the present uncertainty of navigation, and insufficient number of boats employed. It has been found necessary and economical to transport by wagon trains from Utah, California, and the tennement of the Union Pacific railroad, a large proportion of the breadstuffs and sundries consumed in the Territory.

By removing difficulties of navigation this trade will naturally be directed to the east. Rates will be reduced. A large fleet employed on the river, and the prosperity of Montana and of the river interest mutually dependent, will rapidly increase. In view of this mutual dependence, projects have been set afoot for railroad communication between Helena, the capital of Montana, and the river. A railroad from the mouth of the Muscle Shell river is deemed feasible, thus cutting off the rapids. With the rapids improved, a railroad from Fort Benton would be desirable. Montana is a thrifty, growing country, but its growth is greatly retarded by difficulty of communication, even should it be attempted to overcome this difficulty by a railroad from the Muscle Shell, or a branch from the Union Pacific railroad. Years will necessarily elapse before such roads can be made of use, and in the mean time the Missouri river must retain its importance.

Taking such views of the case, I esteem the improvement of the rapids of the upper Missouri not only a necessity, but a duty the government owes to a Territory that promises to be one of our most flourishing States, and a portion of that mountain belt whose settlement will do more towards settling the Indian question than can be done by a powerful and expensive army.

In the middle section of the Missouri, the ports are only at military or fur trading ports, and are enumerated as follows: Fort Thompson, New Fort Sully, Fort Rice, Fort Stevenson, Fort Berthold, Fort Buford, and Fort Hawley. Consignments to these ports are either military supplies, Indian annuities, or the goods of fur traders. During the season of 1867, twenty-eight cargoes were cleared from St. Louis for these several points, amounting to 8,094 tons, of which government shipped 5,832 tons, and private parties 2,262 tons.

The receipts from these ports are hides, horns, and peltries from the fur companies.

The number of passengers, though not great, is yet considerable—mostly officers and soldiers coming from and returning to their posts.

The lower section of the river—that is, from St. Louis to Fort Randall—has of necessity, from the fact of its winding through a fertile and well-populated country, the greatest commercial value, besides carrying all the commerce of the upper river; its own packet trade is perhaps as considerable as that of any western river, and its through trade from its great commercial centre, St. Louis, though competing with railroad transportation, is of fair importance. From the 1st of February, 1867, to the 1st of October, 1867, from St. Louis 212 clearances are recorded for this section, and 169 arrivals. Of the trade from St. Charles, Fort Leavenworth, St. Joseph, and other important points along the section, I am unable to furnish information further than to say that it is very considerable.

The government freight transported on this section amounted during the above eight months to 6,000 tons, and was consigned to Fort Leavenworth and Omaha.

For details of exports and receipts at the port of St. Louis I will refer to the tables annexed, and furnished me by courtesy of Mr. George H. Morgan, secretary of the Union Merchants' Exchange, St. Louis.

For annexed list of government freight, I am indebted to Brevet Lieutenant-Colonel C. W. Thomas, United States army.

Navigation opens on the lower Missouri on the breaking up of the ice, about the last of February or the 1st of March, and continues good until the first or middle of September, when the river becomes so low as to cause great trouble from bars. Boats, however, continue running until late in November, or in favorable seasons until December, when ice closes the season. For the middle section the channel is good until the 1st of August above the Yellowstone, and until the middle of August below. From the latter period until the 1st of November the channel is full of bars and difficult. Boats have cleared from Fort Buford after the 1st of November, but at great risk.

In the upper section but little trouble is anticipated until the 1st of August; after that the rapids become quite impassable in ordinary seasons. The first boats for Fort Benton start from St. Louis the latter part of March, and encounter floating ice on the spring rise above Randall. With boats specially built for the mountain trade, the up trip is made in sixty to sixty-five days; the return in fifteen to twenty days. On the second trip the time to Benton ranges from fifty to sixty days.

During the last season many boats not adapted to the river attempted the trip to Benton, and without success. The *Centralia* started June 12, and was eighty-two days in reaching Fort Hawley; thirty-five on return.

The *Imperial* started May 17, and was eighty-six days in making Cow island; other boats made equally long trips. The increasing demands of the up-river trade caused this addition to the mountain fleet, and has proven the impolicy of sending any but light-draught powerful steamers to Fort Benton, except at the commencement of the season.

Parties interested in the upper river begin to recognize the necessity of a higher initial point than St. Louis. Sioux City will probably soon become the rendezvous of the mountain fleet, since from that point the trip will be much shortened, the dangers of the lower river avoided, and two round trips to Benton assured. Rates of freight and insurance will be greatly reduced, and the commercial interests of Chicago will come in direct competition with those of St. Louis, cheapening the value of goods to the consumer in Montana.

Should it be decided to communicate with the river by wagon trains at the mouth of the Muscle Shell, boats can make from four to five trips in a season with ease, by starting from Sioux City, thus diverting the whole Montana trade to the river.

The map of the river now being made under my direction will not be finished until late in February, when it will be submitted.

For details of my tour of inspection of the obstructions in the river, and of the river commerce, I refer you to the papers accompanying this report. For kind attention and material assistance in performing the duty intrusted to me, I am greatly indebted to Captain Hawley and the officers of the steamer *Miner*.

For many civilities and much useful information, thanks are due to the officers of the army stationed at the various military posts along the river.

In conclusion, I have the honor to be, sir, very respectfully, your obedient servant,

C. W. HOWELL,

Captain of Engineers, Brevet Major U. S. A.

Col. and Brevet Col. J. N. MACOMB,

Corps of Engineers United States Army,

in charge of western river improvements.

CINCINNATI, November 27, 1867.

SIR: In view of the requirement of boats having a light draught of water, and of sufficient strength to undergo the service of removing snags and other obstructions, I would recommend the following dimensions as suitable for such service, premising, however, that slight alterations may be found acceptable on examination of the details of construction:

Hull.—Hull to be one hundred and thirty-feet in length, thirty feet breadth of beam, and five feet depth of hold; the bow of boat to be what is termed a scow, to rake twelve feet before intersecting the bottom of hull; the width of bow to be twenty feet of straight line, intersected by a curve of five feet of a side from the extreme breadth of beam, the stems of the bows to have a butting beam sixteen by twenty inches, securely bolted and fastened, and the timbers of hull to come in union with the butting beam, and bolts running athwart-ship to bind the same; three bulk-heads running the entire length of hull and divided equally as to breadth of beam, and running longitudinally, connecting with butting beam in bow of boat. The hull will be decked in the usual manner of steamboats, but only a sufficient amount of guard projecting from hull to carry the wheels for the propelling of the boat.

Machinery.—The machinery will consist of two engines and a like number of boilers of such dimensions as may be found necessary for the proper propelling of the boat. Two auxiliary engines, one of sufficient power to drive the hoisting apparatus located on the bow, which may consist of a crane or shears; the other engine will be applied to the capstan. The steam used for these engines will be taken from the boilers which are used for supplying the propelling engines.

Cabin.—The cabin will require length sufficient for the accommodation of the usual officers necessary to man the boat.

Your obedient servant,

E. M. SHIELD.

Major C. W. HOWELL,

Captain of Engineers U. S. A.

Monthly expenses of the mountain steamer Miner, Captain Hawley—wages of the crew.

1 captain	\$300 00
1 mate	200 00
1 clerk	150 00

IMPROVEMENT OF MISSOURI RIVER.

2 pilots*	\$1,100 00
2 engineers	300 00
4 firemen	200 00
1 steward†	290 00
1 carpenter	150 00
1 watchman	50 00
2 deck hands	100 00
20 roustabouts, at \$40	800 00

Wages of crew for one month..... 3,640 00

Stores, provisions, &c., \$64‡ per day..... 2,240 00

Expenses, outfit, wear and tear, fuel, &c.§..... 890 00

Total..... 6,770 00

Five months..... 33,850 00

GEO. LEAMAN,
Clerk of Steamer Minor.

Details of crew proposed on a steamer for improving the rapids of the upper Missouri.

1 captain, (an officer of engineers, in charge of work.)	
1 mate, per month	\$200 00
1 clerk, per month	150 00
2 pilots, per month	1,200 00
2 engineers, per month	300 00
4 firemen, per month	200 00
2 assistant engineers, per month	100 00
1 steward, (2 cabin boys, 2 cooks, and 1 chambermaid,) per month,	300 00
1 carpenter, per month	150 00
2 deck hands, per month	100 00
15 roustabouts, at \$40 per month	600 00

Total crew, 32; total wages, (one month)..... 3,300 00

C. W. HOWELL,
Captain of Engineers, Brevet Major U. S. A.

Estimated cost of building and equipping a steamboat for service in improving the rapids of the upper Missouri river—estimate made by Mr. E. M. Shield, principal assistant civil engineer western river improvement.

Building of hull and attachments	\$9,000 00
Boilers, engines and machinery	12,000 00
Cabin and joiner work	3,000 00

* Less than pilots' wages.

† Including 2 cooks, 2 cabin boys, 1 chambermaid.

‡ Can be cut down to \$30 when no passengers are carried.

§ Cut down one-half when no passengers, and with new boat and with greater economy of fuel. Minor burns 30 cords cottonwood or 24 cords hard wood per day.

Painting.....	\$1,000 00
Blocks and tackle, outfit of cabins, cordage, chains, &c.....	4,000 00
Total.....	<u>29,000 00</u>

Estimated cost of working the boat estimated above for five months.

Wages of crew.....	\$16,500 00
Provisions.....	5,400 00
Fuel.....	1,000 00
Blasting powder.....	1,000 00
	<u>23,900 00</u>

Estimate of monthly wages for officers and crew of light-water snag-boat.

Captain.....	\$150 00
Mate.....	125 00
Clerk.....	100 00
1st engineer.....	150 00
2d engineer.....	100 00
Assistant engineer and blacksmith.....	75 00
Pilot.....	300 00
Steersman.....	50 00
Carpenter.....	75 00
Steward.....	75 00
Cook.....	75 00
21 boys for cabin and cook house.....	50 00
Watchman.....	50 00
2 firemen at \$35 per month.....	70 00
8 deck hands, at \$30 per month.....	240 00
	<u>1,685 00</u>

DIARY.

June 28, 1867, 6 p. m.—In obedience to orders from Colonel John N. Macomb, corps of engineers, United States army, dated office of Western River Improvements, Cincinnati, Ohio, June 24, 1867, I to-day started from Cincinnati en route for Omaha, Nebraska, via Chicago, Illinois. It is my intention to reach Omaha on the afternoon of June 30, in time to secure passage for Fort Benton, Montana Territory, on the steamer Deer Lodge, which leaves Omaha on the 1st of July. I have secured as an assistant on the duties specified in my orders Major F. Von Werner, a stranger to me, but having very complimentary letters of recommendation from several distinguished officers, under whom he served as a staff officer during the rebellion. I have directed him to collect such instruments and materials as may be required for surveys and sketching, and with them to overtake me at Omaha or Sioux City, with as little delay as possible.

June 29.—I arrived in Chicago 1 p. m., and left via Chicago and Northwestern railroad 3 p. m., crossing the Mississippi river shortly after dark.

June 30.—Arrived at Ames's station, Iowa, 8 a. m., and was detained to 1 p. m., awaiting repairs to a broken bridge one mile west of station. Reached Council Bluff 9 p. m., and owing to the high stage of the Missouri could not cross during

the night. I am informed that the river is over its banks at the usual ferry landing, and ferry-boats only run during the day, landing five miles above the city.

July 1.—Arrived in Omaha 12 noon, two hours after the departure of the Deer Lodge; and, from the best information I could gain, thought it best to await the arrival of the steamer Last Chance, reported due on the 2d or 3d.

July 2.—Omaha is a city containing from 8,000 to 10,000 inhabitants, and derives its importance from being the eastern terminus of the Union Pacific railroad. Its interests are sustained and forwarded by eastern capitalists and speculators, on the supposition that it will remain, at least for a number of years, the great entrepot for the commerce of the country west and north. It is at present a large depot for the supply of our troops on the plains, and enjoys a lucrative trade with the Territories of Idaho and Montana, receiving its supplies by rail from Chicago, and by river from St. Louis. It is rapidly increasing in wealth and population, but as there is no agricultural country to the west on which it can depend, it can never expect to be more than a distributing point for eastern products, and will soon outgrow the limited demands for those. In case the railroad bridge across the Missouri is constructed at Belleville, fifteen miles below Omaha, we may expect to see the latter city sink to a second place as a commercial point, and gradually decay. The business portion of the city is built on the bluffs above overflow; the railroad and buildings connected with it are located on a sand flat beneath the bluffs, and at this time surrounded by water.

Not hearing from the Last Chance, I telegraphed to St. Louis for information, and on receipt of answer concluded to overtake the Deer Lodge, if possible, at Sioux City or Fort Raudall. This is made possible by reason of the tortuous course of the river, the trip by boat consuming from three to four days, and by stage but twenty-four hours.

July 3.—Starting from Omaha 10 a. m., I arrived at Council Bluffs station 12 m., and at St. John's 1 p. m., where I took stage 3 p. m. for Sioux City, a distance of 100 miles. St. John's is a village of six months' growth, at the junction of the Sioux City branch of the Chicago and Northwestern railroad. The branch is but just commenced, but I am informed is being pushed rapidly forward, and will be completed during the coming winter, making Sioux City the most northern point on the Missouri river having railroad communication with the east. The stage road, after leaving St. John's, runs for forty miles through a hilly country, sparsely settled and timbered; it then strikes the bottom lands below the mouth of the Little Sioux river, and does not again turn into the hills until reaching Sargent's Bluffs, a few miles below Sioux City. Through the bottom lands the road is but a trail, and at many points is subject to overflow. The soil is a rich alluvion, well adapted to farming and grazing. The higher portions of the bottoms are well timbered with a vigorous growth of cottonwood. On reaching the Little Sioux bottom, 9 p. m., I found the road flooded, nearly to the top of the prairie grass, for a distance of nearly five miles; the overflow caused by a storm above, conjointly with the high stage of the Missouri. By liberally feeing the drivers, I induced them to attempt the crossing. The night was quite dark, and the road only indicated by the absence of the grass above the water. In the middle of the swamp the driver lost the trail and mired the horses in a slough, and it was with great difficulty that we succeeded in extricating them and recovering the road. At 4 o'clock on the morning of the 4th we effected the crossing.

July 4.—Arrived at Sioux City at 3 p. m., and found that I had anticipated the arrival of the Deer Lodge, thus gaining time to form an estimate of the importance of the place. Sioux City is a village of between 2,000 and 3,000 inhabitants, all thoroughly imbued with an idea of the future greatness of their town. It is located at the base of the hills above the mouth of the Floyd river, and the business portion is above overflow. The landing is good, but, owing to

a large cut-off which occurred last spring a few miles above, is being slowly cut away, and unless protected will continue to cut for several years, probably forming a bar at the present landing. The valleys of the Floyd and Big Sioux, together with the rich wide bottom lands on the west side of the Missouri, are tributary to the town, and when fully settled will sustain a thriving city.

While in St. Louis last month, collecting information about the upper Missouri, I was informed that, except in extraordinary seasons, two trips to Fort Benton are impossible. It then appeared reasonable to suppose that owners of mountain boats would select some starting point higher up the river. Omaha at that time suggested itself, as the two round trips could be shortened from three weeks to a month. Yet, with all the enterprise and capital concentrated at Omaha, nothing of the kind has been projected, probably owing to the one absorbing idea—railroad.

I am now disposed to think that Sioux City is the proper point for concentrating the upper river trade. The completion of railroad communication with Chicago will bring that powerful rival in direct competition with St. Louis, and aided by Sioux City enterprise, which can only expand in that one direction, we may expect to see within the next few years the trade of Montana and the upper Missouri passing from the grasp of St. Louis, and absorbed by Chicago capital invested in Sioux City.

By starting from Sioux City on the opening of navigation in the spring, boats can complete two round trips in the time now taken to make one from St. Louis and return to Sioux City on the second; or, in other words, from five to six weeks less time than two round trips from St. Louis.

July 5.—To-day heard that the Deer Lodge broke her shaft below Decatur, and will return to St. Louis. I shall remain here to await the Last Chance.

July 6.—Joined by Major Van Werner.

July 7, 8, 9, 10, and 11.—In Sioux City; Last Chance reported disabled at Little Sioux.

July 12, 10 a. m.—The steamer Miner, Captain Hawley, in the service of the Northwestern Fur Company, arrived at Sioux City, having cleared from St. Louis for Fort Benton on the 29th of June. This boat bearing a good reputation for speed, comfort, and the uniform courtesy of her officers, I decided to secure passage on her for myself and assistant, although prepossessed in favor of the Only Chance, reported cleared from St. Louis on the 4th of July. Captain Hawley kindly afforded me every assistance in his power in furtherance of my duty, and placed at my disposal the best accommodations on the boat. We left Sioux City 10.30 a. m., and 2.30 p. m. stopped at Brazeau's woodyard, where half an hour was spent in wooding. We tied up for the night above Ponka, 12 p. m. At Brazeau's woodyard I found the river six feet lower than the highest flood mark for this season. From the 1st to the 10th of July the river fell slowly. We are now going up on a very slight rise, probably due to a storm on some of the tributaries just above. I find the river at too high a stage to make a report on its condition of any value for future operations in clearing obstructions.

The snags visible are mostly on bars and sand points, and, although numerous, are not in the way of navigation. Those visible in or near the course of the boat are to be seen at all stages of the river, and are in consequence not dangerous. The channel is at present so wide that boats can choose their way. It is only when the channel becomes contracted, (at low water,) and boats are forced to seek the deepest water, that snags become very troublesome and cause disaster or delay.

On the up trip I shall confine myself to generalities, and on returning devote my attention to the obstructions; in that way getting the best information possible. I have stationed my assistant in the pilot-house, with all the necessary material, and instructions for making a sketch of the river.

July 13.—Started at 3 a. m.; river full of drift, as it has been for the last four days. All the drift passed yesterday and to-day has been large timber, both dry and green. The maximum stage of the spring flood swept the bottom lands clear of smaller drift and placed it beyond the influence of succeeding stages. The present drift comes from the higher bars, where it was left by the water before the present rise, and from banks now being cut away. In every bend of the river the banks are now undergoing this slow but steady undermining process, and the large cottonwood trees are, one by one, toppling into the stream to anchor, if their roots are sufficiently loaded with earth, to drift on the bars if not. The bottom lands thus far I have found quite well timbered, but it is worthy of note that the timber, though some of it large, is, with few exceptions, young and vigorous; even the dead timber showing that old age was not the cause of death. Lay for the night above Bow river.

July 14.—Started 3 a. m., and reached Yancton village 6.30 a. m. The river wide and clear; the drift less frequent. Laid up 12.30 of the 15th. The country passed during the day similar to that passed yesterday, but with perhaps less timber. The bottom lands are sparsely settled but fertile, judging from the fine-looking corn-field.

July 15.—Started 4 a. m.; arrived at Yancton agency 7 a. m., and at Fort Randall 12 noon, where we lay two hours. Lay up for night twenty miles above, and for the first time on the trip were obliged to cut wood for use of the boat. During the day observed the bottom lands contracting, and timber becoming less abundant. At the mouth of the Niobrara and Pouka there are good bottoms, but above the farming land is confined to the east bank of the river. We are lying near the ranch of Major Hamilton, said to be the last farm we shall see in going up. The hills on either side are very regular in appearance, neatly rounded in outline, and covered with a short, scanty grass, giving at a distance the idea of a well shaven, rolling meadow, but when near at hand disclosing the barren soil, and looking dry and stunted. Timber is confined to the narrow bottom lands and islands, and to the short ravines occurring every few hundred feet. Cottonwood and cedar are the only species I could discover; the cottonwood choosing the low grounds, and the cedar growing in the ravines and on the larger islands. The island cedar is of a very fair growth; that in the ravines stunted, and in many instances deadened by the fires that annually denude the hills.

July 16.—After a good day's run lay up for the night at mouth of creek opposite Bijou hills. The river during the day full of islands, and no doubt bad in low water. Timber not abundant, but in sufficient quantity to meet the necessities of boats. Scrub oaks at several points. The cut bluffs expose a blue stratified rock, having the appearance of soft slates, easily affected by the weather. The lines of stratification are nearly horizontal, and with frequent faults. Drift is becoming less frequent and the river falling slowly. Day clear and warm; night close, and mosquitoes so annoying as to prevent sleep.

July 17.—Started at daybreak, and late in the afternoon passed Fort Thompson without stopping, lying up for night at St. John's woodyard. Slate bluffs continue to bend above Fort Thompson, and there terminate. The fort is located above the entrance to the valley of Cow creek, on a wide, open bottom land, from which the Santee Sioux manage to raise a scanty crop of corn. The fort is garrisoned by a single company of infantry for the protection of the agency. Wood scarce; bottoms narrow; occasional narrow plateaus or prairie taking the place of bottom lands. Many of the hills barren, and topped with a dark colored soil.

July 18.—Reached Old Fort Sully in the afternoon, and spent the remainder of the day in wooding. The fort is the property of the Northwestern Fur Company, and was occupied until recently by the United States; it is now deserted, and the buildings being torn down for wood. Were replenished our ice-box from

a well stored ice-house near the fort. The hills in rear of the fort are covered with cobble-stones of all sizes, and although the same in contour as hills heretofore met, are very different in formation, having a large proportion of gravel. Wood from this point to the mouth of the Yellowstone is reported very scarce; boats depend on getting what they use from drift piles and deadenings in ravines. Green cottonwood is the poorest of fuel, and even when mixed with dry wood does not generate steam fast enough to move boats against a rapid current.

Fortunately for the interest of commerce, each year the bars and various bottoms above detain enough drift to supply the wants of boatmen, but often detain it in inconvenient places. As the commerce of the river expands, wood-choppers will find lucrative employment in establishing woodyards along barren reaches, and collecting drift at points easy of access.

July 19.—Reached New Fort Sully early, and remained until the morning of the 20th, discharging freight for the fur company. We were obliged to land three miles below the fort, the landing near the fort being obstructed by a large sand-bar.

The location of the fort is not well chosen, and subject to severe criticism. The buildings are substantial, roomy, and comfortable. All are not yet completed, but probably will be before winter sets in. Wood can be obtained opposite, and also a few miles above.

Lieutenant Walker, adjutant of the post, kindly offered to keep a gauge record, and collect information of interest, as soon as men can be spared from work on the fort.

July 20.—Left New Fort Sully 12 noon, and lay up for the night near the mouth of the Big Cheyenne. But little drift in the channel, and water falling slowly; current very rapid. Noticed, for the first time, a growth of box elder. The *Ida Stockdale* passed down yesterday, and reported hostile Indians on the bluffs at the mouth of Big Cheyenne. It is a favorite place for attacking boats. The bluffs are high, and the channel runs close under them. The assailants have good cover, and a plunging fire. To guard against attack, we placed semicircular shields of boiler iron, six feet in height, on either side of the wheel, in the pilot-house, and constructed log breastworks along the forward guards of the boiler-deck, and around the ash-pans and engines on the lower deck. Arms were all loaded, and placed in racks at convenient places, and a small old-fashioned field-piece was placed in a conspicuous position on the forward boiler-deck. No danger has been apprehended below this point. Many boats, after leaving Fort Randall, take the precaution, when tied to the bank, of sparring off and mounting guard. We have tied to the bank every night, and kept no guard but the regular watchmen. Captain Hawley informs me that he has never deemed greater precaution necessary.

July 21.—Ran to Small creek, five miles above mouth of Little Cheyenne, and tied up to right bank. Very good dry wood two hundred yards from boat. Were engaged in wooding until 12 p. m. Steamer *Centralia* one hundred yards above us. She cleared from St. Louis June 12, 1867, loaded with army supplies for Camp Cook, and has been delayed by reason of having pilots and captain unacquainted with the river, and, in addition, a mutinous crew of Irishmen.

The captain informed us that he had been burning green cottonwood; and that he could not make enough steam. We are now in the lower part of Swan Lake Reach, known among river men as one of the most troublesome sections of the river at all stages. It is from fifteen to twenty miles in length, and very much obstructed by sand-bars, making the channel tortuous, and difficult to find.

I am informed that Irish crews almost invariably give trouble. They are clanish, and unwilling to bend to the authority of the mate. When they work, it is not with the alacrity desirable, and they seriously object to working in the night. Our crew of roustabouts is made of negroes. They are always cheerful, obedient,

and willing. When brought in contact with other crews, the contrast in the manner of working is greatly in favor of the colored crew.

Our mate, who is an old river man, tells me that he has worked both white and black crews, and has a decided preference for the blacks.

July 22.—Started after sunrise, and passed Swan Lake Reach with less trouble than apprehended. Once attempted a false channel, and were delayed an hour in sparring over a bar having on it three feet of water, the Miner drawing three and a half feet forward. This bar extended diagonally across the channel, and at no place gave a greater depth of water than three feet. Bars in straight reaches of this kind are subject to more frequent shiftings than in tortuous portions of the river, and only approximate to stability during low water. Lay up for the night below Fox island.

July 23.—Laid up at night, and wooded, at mouth of Bowerbense creek. River in excellent boating condition, and falling. No detention during the day. The channel well defined, running close in shore around the bends, and making good crossings. Valleys of the Moreau and Grand rivers comparatively well timbered in the lower portions. Good grazing on the middle slopes. The lower bottoms, thus far observed, all present the same geological features. They have been formed by sand and mud deposited from annually recurring floods; the deposit aided by luxuriant growth of willows, incident to lands subject to overflow. The depth of successive deposits is well shown in sections by alternating layers of sand and mud; even the small deposits from secondary and tertiary overflows being well defined. Owing to this regularity of formation and cause, the ages of points and bottoms can be very accurately ascertained.

July 24.—Wooded, and lay by during night, below the mouth of Battle creek. During the day took on board a deputation of Crow chiefs, on their return to Milk river, where they expected to join their tribe. They were sent to hold a council with General Sully, the Indian commissioner, but failed to overtake him, and are returning to their tribe very much dissatisfied. I am informed that the Crows are the best of up-river Indians, and uniformly peaceful, but that bad faith has been kept with them. They have three times sent deputations to hold council with commissioners, and each time the commissioners have been in too great haste to wait for them. The next commissioners will have to meet them in their own country, and not in the hostile Sioux country.

July 25.—River very good; banks cutting rapidly. Reached Fort Rice four p. m., and remained until next morning. Landed near the fort, inside the bar. The day has been sultry, with indications of a storm. The river has been good during the day, and has fallen slightly. Dry timber has been scarce, and for the last three days we have been obliged to wood several times each day, and pick up such small supplies as we could find. Green timber, though not abundant, is yet in sufficient quantity to furnish boats, provided wood-choppers could safely establish wood yards. Several wood yards have been attempted, but the Indians gave so much trouble that they were soon abandoned. The Indians attack the choppers, drive them to their cabins, and then fire the wood piles. The territorial government also interfered by levying a heavy tax per cord, considered by those I have consulted with on the subject a species of black mail, and not sanctioned by law.

July 26.—Started at three a. m., and, after running about forty miles, stopped to wood on right bank. On starting out again encountered a sudden and very severe storm and blow, which forced us to the bank for an hour, during which time a cottonwood tree, of one foot diameter, was blown across the boat in rear of the cabin, breaking our larboard hog-chains, and crushing through a portion of the boiler-deck. The storm ceased as suddenly as it began, and, after clearing away the fallen tree, we ran a few hundred yards up the river, and tied up alongside a cut bank to repair. When we laid up, the bank was cutting

slowly, but soon began to fall in so fast as to make our position dangerous; tons of earth and willows falling frequently on the lower deck, and threatening to sink the boat. We lay at this place for half an hour, when the small cottonwood to which we had tied—one hundred feet from the bank—was washed in, and we were obliged to move to a better anchorage, which we found three miles above, where we lay for the night.

As an instance of the instability of these bottom lands, I can cite nothing better than the above. The bank under which we lay was eight feet high, and of the characteristic bottom formation, supporting a heavy growth of willows and young cottonwoods, between five and six years old. On our arrival, we found the current slowly undermining the bank. The presence of the boat caused a stronger current in the narrow chute, between bank and hull, and an eddy above; and this slight change in velocity increased the rate of cutting a hundred fold.

July 27.—Although our repairs were not completed this morning, we were obliged to run higher for wood. This we found in the light of the next right-hand bend, where a large pile of excellent drift had lodged on the bottom. We lay by all day wooding, and repairing the damages of yesterday. In the afternoon a hurricane came up from north-northwest, and continued until late at night, with occasional lulls and heavy storms.

As the wind was blowing us directly on shore, no damage was done, although our chimney guys were strained at times to their utmost, and our pilot-house and cabin roughly shaken. The air was filled with clouds of sand, and the water was full of grasshoppers blown off shore. The waves during the height of the hurricane ran three and four feet high, and rapidly beat down exposed banks. A large quantity of green drift passed us during the day.

July 28.—Made a good run, and lay up for night above Square Buttes, twenty miles below Fort Stevenson. Noticed coal at one point cropping out of the bluffs at the water's edge, but not in any quantity. Did not have time to examine it. Hills very bare; good grazing in the bottoms and large ravines. Firewood continues scarce. River good.

July 29.—Started at 3.30 a. m., and reached Fort Stevenson 6 p. m., landing under a cut bank, and very good. The officers at this post report plenty of coal in the neighboring hills, but of a poor quality. It has been used in stoves, but did not give entire satisfaction. It has also been used in the blacksmith shops, but did not give a good welding heat. It is a species of cannel. Stevenson is at present but an encampment. It is expected, however, that before winter fairly sets in, buildings enough to shelter the garrison and stores will be finished. The quarters are to be of adobes, with shingle roofs, and will present a very neat, comfortable appearance. The material for the adobes is found near the site of the fort, and, when mixed with cut prairie grass, promises to make very substantial walls.

The bricks are made larger than usual, but dry well, and retain their shape. The buildings will have stone foundations, and the walls will be strengthened by framing.

July 30.—Left Stevenson 3.30 a. m., and arrived at Fort Berthold 9 a. m., where we lay during the day and night, landing freight for the Northwestern Fur Company. At Berthold I found coal out-cropping, a few yards above the landing, and secured several specimens. It is a coarsely laminated lignite, of a dark-brown color, breaking into small fragments, with irregular, dull fracture when exposed to the air for any length of time; burning with a heavy yellow flame and smoke, and not possessed of great heating or illuminating power. The deposit exposed is in two seams—one of ten inches thickness, and the lower of three inches—conformably superposed on a bed of shale, and covered with a compact gravel. In the hills back of Berthold I am informed this deposit has, for several years, been burning, and so near the surface as to cause the

subsidence of many acres. [Major Galpin, fur company.] Wood scarce between Stevenson and Berthold. River good.

July 31.—Left Berthold at 3.30 a. m., after a wakeful night spent in fighting mosquitos. Lay during the night on a sand-bar in Great Bend. Passed good timber at the mouth of the Little Missouri. Drift in bottom scarce; dead timber becoming more frequent; channel quite clear and of good depth. Noticed several outcrops of coal during the day, all having the same appearance as at Berthold, but showing larger seams and a greater number of them. In one cut bluff, about fifty feet high, I counted seventeen, three of about eighteen inches in thickness each, separated by shale of about same thickness, and about them fourteen at irregular intervals, ranging from one and a half inches to three inches in thickness. The seams might be worked to advantage.

August 1.—Started at 3.30 a. m., and although detained by stoppages for wood, made a fair run, tying up at dusk to a sand point, where we found a very fine drift pile. The hills have gradually lost that regularity of outline so familiar in that section of the valley above Sioux City, Randall, and Sully, and now appear broken and frequently rocky. Sandstone of an indifferent quality and poorly cemented conglomerates alternate with the shales, and frequently crown the bluffs. The immediate valley of the river is very narrow, rarely exceeding 2,500 or 3,000 yards, and presenting low plateaus and bottom lands in nearly equal proportion. The bends of the river in nearly all cases cut into the hills, making high steep cut bluffs with opposite narrow timbered points, concealing barren plateaus outwardly bounded by bluffs and high table lands.

August 2.—Started at daylight, and without stopping, ran until 3 p. m., when we encountered a violent wind storm and were obliged to tie up fifteen miles below "Muddy River," and lay by for the remainder of the day. The river continues at a good stage, though falling slowly. The general characteristics of the valley remain as yesterday. Coal occasionally appears and breaks off. Boulders may be seen in the channel under rocky bluffs.

August 3.—Started at daylight, and without incident arrived at Fort Buford at 5.40 p. m. On approaching the mouth of the Yellowstone the valley widens perceptibly and the bottoms appear more fertile. The timber looks more vigorous and less scattered, the current is stronger and the water-way has a more equitable width. The influence of the very rapid current of the Yellowstone, while gradually accommodating itself to the slower Missouri, is beneficial to the channel of the latter for a distance of nearly one hundred (100) miles below Buford; it then begins to deposit freely and spreads out, forming at low water troublesome bars with shallow chutes. Fort Buford is situated on the left bank of the Missouri, twelve miles below the mouth of the Yellowstone, and on a wide plateau about twenty miles long and from twenty to fifty feet below low-water mark. During the winter of 1866-'67 it was garrisoned by a single company, now increased to five companies. A new fort is now in process of construction to occupy a portion of the old site, to be much larger and to be built of adobes. The timber for the new buildings will be obtained near the mouth of the Little Muddy, some thirty miles above. The adobes are made near the fort and are of good quality.

Yesterday the Sioux made a raid on the cattle herd and killed several animals, but did no further damage, easily escaping from the infantry. Garrisons along this portion of the river are continually annoyed because of their inability to pursue Indian raiders. A company of cavalry at each post would be invaluable.

August 4.—Started from Buford at 8.30 a. m., and were three hours in reaching Fort Union. Started from Union at 1.30 p. m., and lay during the night about thirty miles above. Fort Union is an old trading post, by land three miles above Buford. It will be dismantled shortly and the traders removed to the latter place.

Found the river between Buford and Union very much cut up and difficult.

Above Union it is quite good and with very few snags. The bed of the river is much narrower and the bottom lands wider. The bluffs are continuous on either side, running nearly parallel, touching the river only at each bend and clearly defining the valley. Timber is not abundant, but the bottoms are full of young cottonwoods, giving promise in the future. I to-day left my assistant at Fort Buford with orders to report for office duty in Cincinnati, preferring to sketch the remainder of the river myself.

August 5.—Started at daylight, and after a fair run lay up at 8 p. m. in bend above Poplar river, where we were stopped by a very difficult crossing. Were delayed for several hours in the forenoon by a difficult series of bends below and above Old Fort Kip cut-off. Although the cut-off occurred several years ago, the river has not yet accommodated itself to its bed, and in medium stage of water cuts into the bank so rapidly that the debris cannot be carried away by the already well-charged current, and is consequently left to form troublesome bars in the channel and crossings. The points are quite well timbered with cottonwood, and frequent deadenings at convenient landings supply the necessities of steamboats.

Noticed during the day the ruins of several encampments from which wood choppers were forced last winter. Passed large herds of buffalo, the first seen this trip, and ran into one herd crossing the river. The channel was so completely blocked up by the living mass that the boat was stopped to let them get out of the way. A number were carried under the hull and into the wheel, but cleared us without damage. The scene was one of great excitement, passengers and crew firing with such recklessness as to endanger their own lives to as great an extent as the lives of the frightened buffaloes.

August 6—Were engaged from daylight until 6.30 a. m. sounding for a practicable channel, and at no place could find a crossing giving more than two feet, the steamer drawing thirty-three inches.

At 6.30 attempted the lower channel, and after six hours sparring crossed the principal bar and ran into good water above, where we found the side-wheel steamer *Viola Belle* waiting for a channel to cut out so that she could go down. She had been waiting three days. The *Zephyr* and *Imperial*, bound up, were delayed for the greater part of three days at this place sparring over. We lay for two hours one mile above bar and partially wooded; but finding timber very unhandy 900 yards from boat, ran into next bend and found a fine deadening, where we lay for the night and took in a good supply.

The sand of which these bars are formed is of the nature of quicksand. Iron, stone, or other materials too heavy to be moved by the current sink below the surface of the sand in a few seconds. Men or animals wading on the bars are obliged to keep in motion even on bars apparently dry. I yesterday saw buffalo mired down to their sides and exhausted by their efforts to get out. This characteristic of the bottom makes it simply necessary for a boat when working through a bar to push ahead with its spars and keep in position, so that the current may wash under and around it.

August 7.—Started at 4 a. m. and entered a very troublesome part of the river known as "Spread Eagle Reach," similar in every respect to the "Swan Lake Reach" below Fort Price. We were five hours in making a distance of ten miles. Above the reach we ran into a series of very good bends, and with but a single delay of two hours, caused by taking a false channel, reached a fine deadening, near the mouth of Porcupine creek, and lay up for the night. This part of the river run to-day is but little obstructed by snags, and it is sufficiently well timbered to meet the wants of boats. Deadenings are of frequent occurrence, and convenient for wooding; they are located on the higher portions of each point, and are said to be caused by fire, though they but seldom show traces of it. The great majority of the dead cottonwoods are stripped of bark, and are perfectly dry and sound.

August 8.—Started at daylight, and at 8 a. m. reached Milk river. Above Milk river found the channel very shallow and much obstructed. At 7 p. m. lay up above the mouth of Dry (Doran's) Fork, having made but fifteen miles in the last eleven hours. Were three times obliged to spar over bars, giving but two and a half feet of water. The obstructions in this section are due to a cut-off which occurred several years ago in the bend above Milk river, by which two large bends have been obliterated. The bed of the river is now in a transition state, gradually working toward a natural shape; during high water the current cuts material for lower stages to carry off, and in consequence at a medium stage, such as we now have, when the cutting and distributing powers are about equally balanced, this and similar parts of the river are in their least favorable condition for navigation. Landed our Crow passengers at Dry Fork to rejoin their tribe.

August 9.—Started at 4 a. m., and till 4 p. m. had but little trouble. Not much water in channel, but the bends quite regular, and in consequence the channel well defined. Lay by from 8 a. m. until 12 m. for wood; 4.30 p. m. obliged to spar over a difficult bar, and in doing it broke a guy rope of derrick, and were detained by the accident until 6.30 p. m. After crossing the bar we ran until 9 p. m., when we lay up for the night. Passed several rocky bottoms during the day, but with good depth of water, and enough channel room to avoid boulders by running carefully.

August 10.—Started 4 a. m., and ran what is known as the Round Butte section, beginning fifteen miles below the Butte, and ending three miles above. We ran carefully and without sparring cleared the Butte Bend 1 p. m. The channel is badly cut up by sand and gravel-bars, with boulders, in portions near shore. The river throughout this section is wide and shallow, and the channel tortuous.

After passing the Butte, the valley assumes a character not before observed. The river winds in short regular bends through bottom lands ranging from half a mile to a mile in width, shut in by bold fancifully-shaped hills, bearing a stunted irregular growth of cedar and pine. The points are all well wooded midway to the hills; the banks are low and rounded except in the bight of bends, where the current has cut into the base of the hills and left perpendicular bluffs of from five to thirty feet in height. Sand points but seldom occur, and the few bars to be seen are formed near the middle of the stream. The river is very clear of snags, and the depth of the channel quite uniform.

There are but few signs of recent flood changes, and those but slight. At one point in a cut-bluff twenty-five feet high, saw a large cottonwood tree eighteen inches in diameter, half washed out by the last flood, showing that after the tree had obtained its present growth the plateau on which it grew had received a deposit fifteen feet in depth. The top was stunted and decaying, and trees having the same appearance were to be seen around it, and on all similar plateaus observed during the day.

From the general formation of these plateaus, I am disposed to think that they were made by washing from the hills and indicate a very rapid denudation, which gives to this portion of the river its stability by giving it firmer material for its bottom lands than the ordinary flood deposit. Eight p. m., passed the steamer Zephyr, bound up, and 8.30 p. m., tied up for the night and wooded below Point au Poche.

August 11.—Started at 4 a. m., and reached Fort Hawley 9 p. m., river continuing the same as yesterday. Plenty of good timber on all the points. Channel in mid-river nearly all day; frequent bouldered bottoms, requiring care in passing them; width of river quite constant, ranging from 150 to 200 yards.

August 12.—Started 4.30 a. m., and without trouble reached Two-Calf island 8 p. m. Tried to pass the right hand chute and found it closed at the head by a bar giving only one foot water; so backed out and lay up for the night.

River the same as 11th and 12th, with the exception that the valley is more contracted and timber is less abundant.

Two-Calf island is the beginning of the rapid section of the river. Passed the steamers Richmond and Guidon bound down, below Harriott's island; lay up from 12 m. until 6 p. m. above Harriott's for wood; cut pine and cedar on the bluffs, and were obliged to carry it several hundred yards to the boat.

August 13.—Started 4.30 a. m., and passed up the middle chute at Two-Calf island; obliged to get out cable and pull over rapids at head of chute; two and a half hours in passing the rapids; made slow progress against a very rapid current to head of Grand island, where we were obliged to spar over a gravel bar giving two and a half feet water. Made the crossing 1 p. m., and reached Cow island 5 p. m., where we lay up to sound the rapids for a channel; obliged to keep the lead going most of the time during the day; from five to eight feet in the channel; bottom rocky; bottom land very narrow and covered with sage brush. Good timber on Grand island. Found three feet over the rapids in east chute, and would have no trouble in getting over if it were not for the boulders that infest the channel. Will have to pull over to-morrow.

Laid a deadman on shore above the rapids to fasten our cables for pulling up. A deadman is laid in the following manner: A trench four feet long perpendicular to the line of tension, and from two to three feet deep, is dug on shore, and a log of wood securely fastened on the bottom by stakes; to this log the string-line is fastened, and a small trench dug in the direction of the boat to accommodate the rope and prevent a lifting strain. From this deadman a line is taken to the capetan.

August 14.—Passed the rapids 3 p. m., and lay up two miles above, at the terminus of the Fort Benton and Cow island wagon road. With the present stage of water it is not considered probable that we can get above Dauphin's rapids. Captain Hawley has decided to leave his Fort Benton freight here, and attempt the upper rapids, drawing as little water as possible. On our arrival we found the steamer Imperial lying at the bank, with all her freight ashore. She was obliged to double trip from Grand island to this point, drawing three feet, and was two days in passing Cow island. She cleared from St. Louis May 18, drawing three and a half feet. During the night put our Benton freight ashore and lightened to twenty-six inches.

August 15.—Started at 7 a. m., and at 11 a. m. had made six miles, when we were laid up for an hour by a wind storm. After the storm we again pushed ahead and tied up at night two and a half miles below Dauphin's rapids; found from three to four feet in the channel. Found plenty of water over Snake Point rapids, and passed them without trouble, although for a moment in danger of swinging on the rocks and wrecking the boat; channel much obstructed by loose rocks in the greater part passed to-day. Current very strong; wood very scarce.

August 16.—Started at 5 a. m., and at 8 a. m. tied up one mile below Dauphin's, having made one and a half mile in three hours. Careful sounding gave but eighteen inches water over the boulders in the rapids, and three feet if they could be removed.

The captain then decided to abandon the trip to Benton and return to his freight above Cow island, rather than further risk the safety of his boat. Seven p. m. we started on our return, and after making three miles tied up for the night. During the day I examined the rapids and climbed to the top of the hills. A distance of two or three miles from the river I found abundance of excellent pine timber growing in the ravines and hollows. To the south I could see the Judith mountains and intervening ridges, apparently all well timbered.

August 17.—Started at daylight, and had no trouble until reaching Snake Point, where it was deemed necessary to get out bow and stern lines to drop the boat through. In executing this manoeuvre we grounded on a flat rock and were delayed until noon before getting off. Two miles below Snake Point, in

making a crossing, the current drove us on a gravel bar, where we lay all night. Everything movable on the boat was put ashore in yawls to lighten her, after which we took a cable ashore and made ready to pull off in the morning.

August 18.—At 11 a. m., by pulling and sparring, succeeded in getting off the bar, and taking wood and freight on board reached our Benton freight pile without trouble at 1 p. m. The rapids I have had an opportunity to examine can be very much improved and rendered passable by simply removing the boulders in the channel; most of them can be taken out without blasting. Further improvement can be made by closing island chutes, thus gaining increased depth of channel, and greater scouring power to the current. Improvements of the latter kind can be made permanent and at small expense, as all the necessary material can be found at hand, and much of it ready for use.

August 19.—Spent the day among the hills to the south of Cow island, and in making a survey of the obstructions. Found plenty of good stone on the north bank, and plenty of good pine timber convenient for use on the south side. Game is abundant; a working party could easily supply themselves during the summer and fall without going many hundred yards from camp. Indians make their appearance but seldom. It is too far north for the Sioux, and the Crows are friendly and have better hunting grounds.

The steamers *Only Chance* and *Zephyr* passed the rapids this morning with but little trouble, but are double-tripping from Grand island. *Only Chance* discharged her freight and returned to Grand island for remainder.

August 20, 7 a. m.—Started down the river, and had no trouble until we reached the head of Grand island. There found the *Only Chance* hard aground in the head of the chute, having been carried there by the current after crossing the bar. In attempting to cross the bar too high up, we ran aground, 10 a. m., and did not get over until 5 p. m. Ran until dark without further trouble.

August 21.—Started at daybreak, and at 9.30 a. m. arrived at Fort Hawley, a trading post of the Northwestern Fur Company. Left Hawley 12 noon, and at 4 p. m. reached our wood-pile of the 11th, where we lay up for the night. During the afternoon we were greatly retarded by a strong head wind, which twice drove us into the bank and twice set the boat on fire by sparks from the chimneys. The crew were engaged in wooding until 11 p. m. Since leaving Fort Buford we have been well supplied with fresh meat, principally of buffalo, deer, antelope, and wild geese. The country is full of game, and several of the mountain boats we have met depend so much upon a good game supply that they only bring as stores hard bread, ham, bacon, sugar, coffee, and a few cans of vegetables.

August 22.—Started at daylight, and at noon ran hard aground on a bar nearly opposite Round Butte. Put our wood and freight ashore with the boat's yawls, and, after five hours' sparring, aided by a shore line, worked off and tied up for the night. Thus far down I have not noticed any perceptible change in the channel. Just below, the channel through which we ran in coming up is completely filled, and a channel worked out on the opposite side of the river, giving two feet large in the shoalest place. The Miner is now drawing two feet scant, which will not be greatly increased by the little freight she expects between this and St. Louis.

August 23.—Started at daylight, and at 7 a. m. ran aground on a hard bar opposite Round Butte. Again landed our wood and stores in the yawl, and tried to spar off, but without success; finally laid a deadman on shore above us, and at 4 p. m. pulled off and reloaded. Made a short run, and without further trouble made a landing ten miles below the Butte. Tied up for the night and wooded.

August 24.—Started at daylight, and, without sparring, reached a point two miles below Milk river, where we found a very bad crossing, and were obliged to lay up for the night and sound for a channel.

Found the river from Round Butte to Milk river greatly changed, and for the better. The majority of crossings are lower down than we found them on the up trip, and deeper; several bars have entirely disappeared, and no new ones found. The channel has now reached its low-water position, and, unless shifted by a fall flood, will probably remain as at present until the breaking up next spring.

On the up trip I noticed a peculiarity of all wooded points from the mouth of the Yellowstone to the Round Butte, which proves a continual shifting of the river bed towards its mouth. On the upper side of all points the banks are cut, and large cottonwoods are growing to the brink. In passing around the point the cut bank becomes less and less in height, and the growth of timber gradually becomes younger, until the point culminates in a growth of willows, and beyond these plain sand. On the lower side of the point, until entering the bight of the succeeding bend, the shore slopes to the water, with first a sand beach, then willows, young cottonwoods, old cottonwoods, and next the plateaus, dead cottonwoods, in regular gradation of age, showing plainly regular denudation of the upper part of the point and regular formation on the lower side. This gradual movement towards the direction of the current is also shown by the bluffs on either side, the whole line showing that at some time each portion of it has been subjected to the direction of the river. The bearing of this characteristic on any plan of improvement is plain, showing that any improvement now made, unless it be for protecting the banks, for a few years hence will be on dry land.

August 25.—Started at 5 a. m., and, in attempting to enter the chute in rear of the island to which we tied last night, ran aground, and were swung around by the current so as to lie directly across the channel, as the width of the chute was a little less than the length of the boat; and as the current set in very strong, we found great difficulty in getting off, but succeeded after two hours' sparring, and had no further trouble of moment. The island and chute lie near the centre of Milk River reach, and the cutting of the channel at this point determines its characteristics through the reach. Should the channel choose the chute, the reach will be fair; but should it choose to cross the bar, it will continue bad quite through the bend below.

The channel through the reach we found tortuous, but regularly formed and good, giving three, four, five, and six feet of water. We stopped to wood about noon, and were detained two hours, after which we ran to Fort Charles bend, and at 4.30 p. m. lay up for the night alongside a good deadening. During the day saw thousands of buffaloes and abundance of other game.

August 26.—Started at 5 a. m., and laid up at 4 p. m., on account of wind in bend below Elk Horn prairie. Had no trouble during the day. Found three, four, and four and a half feet water on the worst crossings in Spread Eagle reach, and two and a half feet over crossing in bend above Poplar river. The crossing at this latter place, although the river has fallen about two feet, is nearly the same as we found it going up; it is in the same place and has the same depth of water, but is not so tortuous. Two bends above Wolf Point are much obstructed by snags, but are cutting freely and shifting the channel.

August 27.—Started at daybreak and reached Fort Buford 6.30 p. m. Were delayed by a strong wind which sent us to the bank several times, but without damage. Below the Big Muddy, at several points, high, steep, rocky bluffs rise from the water's edge and deposit dangerous rocks in the channel, which it would be desirable to clear. Coal makes its first appearance in these bluffs on the right-hand side and in fair seams. I am informed that those deposits of coal out-crop on the Yellowstone as far up as Powder river, and no doubt underlie the whole peninsula between the Yellowstone and Missouri. The buildings at Fort Union are nearly demolished, and the material taken to Fort Buford. The river between Union and Buford is very much cut up, but has fair water

in the channel. The Yellowstone is very low, and at its junction with the Missouri falls about eighteen inches in a distance of 100 yards, over loose rocks and with a very rapid current.

August 28.—Started from Buford 8 a. m., and at 12 m. were forced (by a strong wind) to tie up. Started again 6.30 p. m., and at dusk lay by for night, twenty miles below Muddy river. Channel fair and but little changed in the last month; but few snags, and those not large or troublesome. The river full of drowned grasshoppers.

August 29.—Started at daylight, and after a fair run lay up below Tide creek. After passing Little Knife river found the channel full of bars and difficult; grounded several times, but were not greatly delayed, except by the necessity of running slow and sounding frequently. Day very warm and indication of a storm.

August 30.—Arrived at Fort Berthold 12 noon, and left 6 p. m., expecting to make Fort Stevenson before dark. Eight miles below Fort Berthold encountered a violent wind storm; were driven to the bank and were obliged to tie up for the night. The wind was so strong that birds left the trees and sought shelter in the under-brush. Just before dark one of our pilots caught a half-grown war eagle, who had sheltered himself in the bushes and could not rise from them. From Little Knife river to Berthold the river is obstructed by bars and a few snags; below Berthold it is in better condition.

August 31.—Arrived at Fort Stevenson 8.30 a. m., and left 11 a. m. River improving; day cold, damp, and windy. Four p. m., lay up below the mouth of Big Knife river to wood, and remained during the night. Channel well defined and with good water. Not materially changed since going up, although the river has fallen about four feet in that time.

September 1.—Started 5 a. m., and without trouble reached Fort Rice 3.30 p. m. Here we expected to find forty cords of good dry wood cut and awaiting us, but were disappointed. The wood, though cut and well concealed, attracted the attention of another boat, and we reached the wood-pile only in time to see the Centralia leaving with thirty cords on board, and Captain Hawley obliged to pay the bill, eight dollars per cord.

Left Rice 6 p. m., and ran below the Cannon Ball, where we spent the greater part of the night picking up drift.

September 2.—Started 5 a. m. and ran until 4 p. m., when we were forced by wind to lay up forty miles above Grand river. Day raw and windy, with occasional drizzle. River good and had but little trouble, only grounding twice, and both times sparring off with ease. In conversation with Major Galpin, one of the oldest fur traders in this country, and the best informed I have met, he expressed the desire of all those interested in the development of the Upper Missouri valley for a thorough geographic and geological survey of the country drained by the Little Missouri, Heart, Big Knife, Cannon Ball, Grand and Moreau rivers. He has been over the greater part of the basin drained by those streams, and is impressed with its value as a grazing and mining country. From his report I should judge a survey of importance in establishing future reservations for the Sioux Indians. I am informed that the climate is undergoing a gradual but marked change for the better, noticed even by those who have spent but a few years along the river. Rain is more frequent, vegetation more luxuriant. Winter sets in late, and in places cottonwood trees are giving way to ash and elms. Corn, potatoes, and oats have been grown as far up as Fort Union, and although the stalks were stunted, the grain was of fair size and quality. At Berthold I saw ears of corn six to eight inches in length grown on stalks from eighteen inches to two feet in height.

September 3.—Started 5 a. m., and made a good day's run, tying up at 7 p. m., to right bank below Plum island, and fifteen miles above mouth of Big Cheyenne river; quite good, with the exception of Swan Lake reach, where

we found the channel well cut, but very tortuous. In passing the reach we were favored by a dead calm, which facilitated the handling of the boat, and enabled us, by running carefully, to keep the channel. Below the reach we were delayed an hour by taking the wrong outlet, but afterwards had no trouble. The bluffs passed to-day are based on a blue clay shale, crumbling where exposed, and easily blown down by wind. On the bluffs under which we lay during the night I found a group of sienitic boulders, some of them weighing as much as three to four tons. Wood scarce.

September 4.—Reached the Big Cheyenne 9 a. m., and lay for night ten miles below, having found a very bad river, much spread out and full of sand-bars. Strong wind during the night, slightly abating before morning. Near this point, when going up, we found in abundance a plant used by the Indians to cure the bite of the rattlesnake. The stem is from two to four feet in length, and from an eighth to a quarter of an inch in diameter; the leaves long and slender, and from four to six inches apart, joining the stem along the line of a very oblique spiral. The stem is crowned by a yellow flower, about two inches in diameter, and having the appearance of a small sun-flower. The root is long, and has but few ramifications. When stripped of its thick outer coating, it shows markings and color very much resembling the skin of the rattlesnake. My informant, an old hunter, who pointed out the plant, informed me that he had often seen it used, and with success. The person bitten chews a small piece of the root, swallows the juice, and applies the pulp to the bite. The root has a pungent acid taste, but is not unpleasant. Doctor Kimball, United States army, stationed at Fort Buford, has a quantity of the plant, and will report on it to the medical department.

September 5.—Started 5 a. m., and reached old Fort Sully 12 noon. Were several hours in passing Farm island. The day clear but cool, and windy. Ran the channel to the right of Farm island, and were several times blown aground. At dusk ran hard aground five miles below the island, and lay during the night on the bar. Steamer Last Chance overtook us, and lay during the night a few hundred yards above.

Farm island is considered one of the worst places on the river, as the channel shifts frequently from one side to the other. The buildings at old Fort Sully are all torn down.

September 6.—Made about fifteen miles, and lay up on account of wind; channel fair, but the surface of the water so much broken by the wind as to make it difficult to determine its position. Day clear and cool.

September 7.—Were not able to start until 6 p. m.; we then made five miles, and tied up for the night; wind continuing; plenty of water in the channel—from three to ten feet, but the surface too rough to make the crossings. A stern-wheel boat is unmanageable in a high wind, unless loaded down, and even then it is generally safer to tie up than to run. The wheel can only act in the direction of the boat's longer axis; and in consequence, when moving obliquely to the wind, the boat has a certain amount of lee-way, for which there is no remedy, and she is blown on a bar in narrow crossings, or ashore in bends. With a side-wheel steamer it is different, for the wheels can be used in steering, and become powerful aids to the rudder when used skilfully. The only objection to side-wheels is the amount of drift met in the early and middle seasons, to which they are very much exposed, and from which stern-wheels are in a measure protected by the hull.

September 8.—Started at daylight, and at 9 a. m. were blown ashore by the wind about twenty miles above Fort Thompson, where we lay until 4 p. m. The bluffs at this point are composed of alternating layers of sand, gravel, and clay shale at their foot, and apparently coming from the gravel beds. I found large numbers of two casts, (shell and reptile,) some of them having a metallic filling of a light reddish brown color, very finely granulated structure, and of such

hardness as to scratch glass with as much ease as a diamond would. The cross section of these reptile casts is an ellipse, showing a vertebral joint, solid in the centre of the ellipse, and with six radial points running to the outer coating, which is a rich pearl, covering oak leaf markings on the inner skin. I have found at this place, and at several points further up the river, a large number of these remains, with metallic spar and claystone fillings, yet, although I searched diligently, could not find a head. The diameter of those seen varied from a quarter of an inch to one foot. One small specimen, in my possession, has become highly polished in the exposed point, and resembles polished copper. The shell casts are of sand and claystone, some of them with the shell yet adhering.

Started again 4 p. m., and at night lay up at right bank opposite Crow creek, with wind continuing strong.

September 9.—Ran well all day, and reached upper landing at Fort Randall 5.30 p. m. The channel runs close to Randall Point, and is obstructed by loose rocks, causing a very stiff current around the point. At 6.30 we attempted to cross the bar opposite Randall, and ran hard aground. The bar washed from under us very rapidly, and at 12 midnight washed us across, where we lay until morning. An anchor put out above us in eighteen inches water, when raised in the morning, was found in a pocket six feet deep. This bar is a very troublesome one, and can only be remedied by clearing the channel at the point above, and throwing the water in bulk to the left shore. All the boats down within the last two weeks have grounded here, and lain from six to forty-eight hours. The day has been quite windy, and we were several times driven ashore. We passed the Centralia above Hamilton's ranch, waiting on the wind.

September 10.—Started 7 a. m., and at 8 a. m. ran aground opposite Power Butte. The morning is clear and cold, with but little wind; cleared the bar at noon, and 2 p. m. reached Yancton agency; the wind in the mean time having suddenly revived and driven us once ashore. Since leaving Fort Rice I have noticed a peculiarity in the bar formation, but seldom observed above. Sand bars and sand islands form in the middle of the stream, giving a series of middle bars and doubtful crossings, the channel shifting frequently from one side to the other, and giving a difference in depth on either side so small as to often deceive the most practiced pilots.

Above Rice these middle bars are the exception, the bars forming below each point, and running obliquely towards the next lower, permitting but a single crossing, and that generally well defined. Left Yancton agency 5.30 p. m., and lay for the night above the mouth of the Niobrara.

September 11.—Started at daylight, and lay up for the night at the mouth of Vermillion river; found the channel much obstructed by snags, those most in the way being of recent deposit. In the bed below Yancton village, boats have been obliged to cut a channel through a cluster of very large green trees, deposited within the last three weeks. The snags vary in diameter from six to eighteen inches, and the most troublesome come from this season's cuttings.

The mouth of Vermillion river is dammed up for a distance of two hundred yards by a deposit of mud and sand from the Missouri. Over this distance the Vermillion falls five and a half feet with a rapid current. The water-way is ten feet wide, and from one to two feet deep; the water clear and cold. All the small streams below the Yellowstone have been dammed in a similar manner, but have cut out so far as observed. Above the dam the Vermillion is about fifty yards wide, and with a sluggish current.

September 12.—Started at daylight, with a better river than yesterday, but still much obstructed by snags. Morning cloudy, with a little wind. Reached Sioux City 2 p. m. and remained until 3 p. m. Lay up for the night fifteen miles below. In the first bend below Sioux City made a square crossing, and at its terminus found the channel contracted to about 100 feet, very deep, and so full of snags that we were half an hour in working our way through them. The

bank was from ten to fifteen feet high, and falling in rapidly, promising to increase the width of channel and the number of snags. At Sioux City recommenced sketch to connect with starting point of my assistant.

September 13.—Started at daylight, and ran well all day, reaching Omaha shortly after dark. The river very tortuous, and the bends full of snags. The section from Sioux City to Omaha is considered the most dangerous part of the Missouri, and when once cleared will require constant attention to keep it free from snags. Winding for the greater part of the distance through low, easily cut bottom lands, it is subject to very rapid and radical changes of its bed. Each flood sweeps into its channel many hundred acres of timber to form dangerous snags, and frequent cut-offs occur to add further obstructions. At several points to-day the pilots informed me that the whole water-way had shifted within the last two months from 300 to 400 yards into timbered points, leaving the last year's channel a barren sand-bottom. On the night of the 8th of July a cut-off occurred above Peru completely changing the channel for fifteen miles on either side. Several boats were carried through on the 9th, and barely escaped being wrecked. Another shortly afterwards, less fortunate, struck a log and was lost, together with several of her crew.

September 14.—Started at 11 a. m., and at 1 p. m. were driven ashore by the wind at St. Mary's cut-off, and were obliged to lay by the remainder of the day. Boats have had trouble just above and in the bend below us, even the packets getting aground, yet the river is considered at a good boating stage, and the river trade is quite brisk. Toward night the wind increased in violence, and the clouds of sand from the old bed of the river, and from the point below us, were almost blinding.

September 15.—Wind very strong all day, and we have not moved from our landing. Every portion of the cabin and state-rooms coated with sand. Three boats passed us bound up; two of them side wheel steamers, and the third a stern-wheeler. The side-wheel boats passed the bar above, and the stern-wheel was driven aground by the wind. Direction of wind from south to north.

September 16.—Wind at times increasing to a hurricane, and continuing from the south, with indications of a storm coming up from the northwest. The side-wheel packet *Cornelia* passed us, down, late in the afternoon, and the *Sunset*, ditto, after dark, tying up one mile below.

Lay by all day and have fair hope of being able to push ahead to-morrow, as these blows generally last but three days.

September 17.—The wind having moderated during the night, we started down at 6 a. m., and made a run of about seventy miles, when the wind increased to such violence as to drive us to the bank at Nemaha, 1 p. m. A pelting rain accompanied the wind and forced me to put my sketch aside and depend on my notes of obstructions. The wind abating in a few hours, we again started down, and lay up for the night twenty miles below Nemaha. Passed the *Cornelia* at Brownville, the *St. Joseph* and *Sunset* at Plattsmouth, and the *Underwriter*, of Cincinnati, at the wreck of the *H. S. Turner*, employed in raising it. With our light-draught we have been able to run well, but boats drawing from three to three and a half feet experience great trouble in several of the crossings.

Dangerous snags are of frequent occurrence, and all the bends are more or less obstructed.

September 18.—River fair all day. Reached St. Joseph 5.30 p. m. and remained until next morning. The crossing above St. Joseph, which three days ago gave great trouble, and necessitated sparring on three feet of water, is now cut out, and at no place has less than five feet over the bar. Snags have not been so frequent as yesterday. Day fair and warm.

September 19.—After a run of 175 miles, lay up for night at a wood-yard below

Liberty. Night clear and cool. As wood is quite an item in the economy of a steamboat, I have collected the following tariff of prices :

At Fort Hawley, \$8 per cord ; at Fort Rice, \$8 ; at Fort Randall and above, from \$6 to \$8 ; above Sioux City, \$5 ; above Omaha \$2 50 to \$3 50 ; from Omaha down, \$2 to \$3. The Miner burned, in twenty-four hours, twenty-four cords of hard wood, or thirty cords of dry cottonwood. A portion of the river passed to-day is in very good condition, and other portions shallow and snaggy. Almost every bend has its wreck to attest the danger of navigation. Many of them are rotten with age, but others are of recent date, and have become dangerous obstructions. The current is slowly eating into the upper bight of each bend, removing the flood deposit, and daily disclosing new snags. It is a peculiarity of the Missouri, due to its wide flood-bed and low bottom lands, that when at flood height, the channel is cut across the sand points, making the the bight of the bend low down, and filling in above. As the water falls, the channel gradually works out from the point, the bight is made further and further up ; shallow bars form, cut away, and reform with wonderful rapidity and uncertainty, and when the river attains its medium stage, the channel has passed over the greater part of the bed in the upper half of the bend, and brought, in succession, each snag in that portion directly in the way of navigation.

September 20.—Ran to Slaughter-house island, just above Lexington, and tied up for the night. During the day have passed alternating sections of good and bad river, reported in detail in my snag record ; above Glasgow one very bad bend obstructed by bars, and also a similar series of bends and crossings above and below Slaughter-house island. From Glasgow to the latter section the channel is remarkably good. The day has been warm and pleasant.

September 21.—Were detained at our moorings until 8 a. m. by a fog. We then ran until dusk, and tied up one-half mile above Pinkney. Found the channel much obstructed by bars and snags. Loaded boats have had great difficulty at several points passed during the day ; as we draw but two feet, we have had no trouble. The fog this morning, though not heavy, clung to the water and obscured the view at a distance ahead, so that the pilots could not judge of the terminus of the Pinkney and Miller's Landing crossing, and be sure of taking the proper channel.

September 22.—Again detained by a fog until 8 a. m., when we started from Slaughter-house island, and at 1.30 p. m. made St. Charles without trouble, although we passed several very bad bends full of snags. Made St. Louis 5.30 p. m. The river from St. Charles to St. Louis very good, with the exception of the Chobenier islands section, where the channel is liable to frequent shifting from one side of the island to the other. The importance of clearing the river of snags from its mouth to Omaha is in a great measure due to the packet trade on that section, which necessitates running at night and makes obstructions of the kind so much the more dangerous.

September 23, 24, and 25.—Remained in St. Louis, collecting commercial statistics from the quartermaster and commissary departments, and from the records of the Union Merchant Exchange.

September 26, 3 p. m.—Started for Cincinnati via Ohio and Mississippi railroad.

September 27.—Arrived in Cincinnati 5 a. m.

Place of departure.	Date.	Time of—		Time. Hours.	Delay.	Cause.
		Starting.	Stopping.			
Stionx City	July 12.....	10.30 a.m.	12 p.m.	3		Wooding at Brayean's.
Ponka	July 13.....	3 a.m.	10 p.m.	1		Wooding.
Bow River	July 14.....	3 a.m.	12 p.m.	1		Wooding.
Ponka Agency	July 15.....	4 a.m.	7 a.m.	3		In port.
Yankton Agency	July 15.....	8 a.m.	12 p.m.	4		Cutting wood.
Fort Randall	July 15.....	2 p.m.	8 p.m.	6		Wooding at Old Fort Sully.
Hamilton's Ranch	July 16.....	3 a.m.	9 p.m.	6		Discharging freight, &c.
Byon Hills	July 17.....	4 a.m.	9 p.m.	5		Wooding at foot of Swan Lake Reach.
St. John Woodyard	July 18.....	4 a.m.	1 p.m.	9		Wooded below Fox island.
Old Fort Sully	July 19.....	4 a.m.	12 p.m.	8		Wooded at Bombeuse creek.
New Fort Sully	July 20.....	12 m.	9 p.m.	9		Wooded below Battle creek.
Below Big Chelyenne	July 21.....	4 a.m.	6 p.m.	2		Discharging freight.
Foot Swan Lake Reach	July 22.....	5 a.m.	6 p.m.	1		Wooding 40 miles above Rice.
Below Fox Island	July 23.....	4 a.m.	6 p.m.	2		By storm and damage to boat, &c.
Bombeuse Creek	July 24.....	4 a.m.	6 p.m.	2		Repairing damage, wooding, and wind.
Below Battle Creek	July 25.....	4 a.m.	6 p.m.	2		Wooding at Square Buttes.
Fort Rice	July 26.....	3.30 a.m.	1 p.m.	7		Discharging freight at Berthold.
Forty miles above Rice	July 27.....	4 p.m.	6 p.m.	2		Sand bar in Great Bend.
Forty five miles above Rice	July 28.....	7 a.m.	9 p.m.	2		Stopping several times for wood.
Sixty miles above Rice	July 29.....	3.30 a.m.	6 a.m.	2		Wind storm.
Square Buttes	July 30.....	3.30 a.m.	6 a.m.	3		Discharging freight at Buford.
Fort Stevenson	July 31.....	3.30 a.m.	9 p.m.	6		Discharging freight at Buford.
Fort Berthold	Aug. 1.....	3.30 a.m.	9 p.m.	6		Stopping at Fort Union.
Sand Bar, Great Bend	Aug. 2.....	4 a.m.	3 p.m.	9		Difficult bars near Fort Kip.
At White Earth River	Aug. 3.....	3.30 a.m.	5.40 p.m.	12		Six hours sparring; six hours wooding.
Below Muddy River	Aug. 4.....	3.30 a.m.	11.30 a.m.	8		
Fort Buford	Aug. 5.....	1.30 p.m.	8 p.m.	6		
Fort Union	Aug. 6.....	4 a.m.	8 p.m.	4		
Below Stone Point	Aug. 7.....	0.30 a.m.	4 p.m.	13		
Above Poplar River	Aug. 8.....					

Itinerary of route—Continued.

Place of departure.	Date.	Time of—		Delay.	
		Starting.	Stopping.	Time. Hours.	Cause.
Second Bend above Poplar River.....	Aug. 7.....	4 a. m.	7 p. m.	6.30	Four and one-half bars; two wooding.
Near Porcupine Creek.....	Aug. 8.....	4 a. m.	8 a. m.	.....	Reached Milk river.
Milk River.....	Aug. 8.....	8 a. m.	7 p. m.	.....	Fifteen miles in eleven hours.
Dry Fork.....	Aug. 9.....	4 a. m.	9 p. m.	2	On bar four hours for wood.
.....	Aug. 10.....	4 a. m.	8.30 p. m.	.....	Slow past R. Butts.
Point Au Pache.....	Aug. 11.....	4 a. m.	9 p. m.	1	In false channel.
Fort Hawley.....	Aug. 12.....	4.30 a. m.	8 p. m.	4	To speak steamer Gurdon, and to wood.
Two Calf Island.....	Aug. 13.....	4.30 a. m.	5 p. m.	7.30	Rapids and bars.
Cow Island.....	Aug. 14.....	6 a. m.	3 p. m.	.....	Nine hours passing rapids.
Benton Road.....	Aug. 15.....	7 a. m.	7 p. m.	2	By storm two and one-half miles below Dauphin's.
Two and one-half miles below Dauphin's.....	Aug. 16.....	5 a. m.	8 a. m.	.....	One and one-half miles in three hours.
Dauphin's.....	Aug. 16.....	7 p. m.	8 p. m.	3	At Snake Point.
Five miles below Dauphin's.....	Aug. 17.....	4 a. m.	1 p. m.	7	Below Snake Point, on bar.
Snake Point.....	Aug. 17.....	12 a. m.	1 p. m.	6	Below Snake Point, on bar.
On Bar.....	Aug. 18.....	10 a. m.	10 a. m.	7	Grand Island bar.
Benton Road.....	Aug. 20.....	7 a. m.	8 a. m.	.....	
Grand Island Bar.....	Aug. 20.....	5 p. m.	9.30 a. m.	.....	
.....	Aug. 21.....	4 a. m.	4.30 p. m.	2.30	At Fort Hawley.
Fort Hawley.....	Aug. 21.....	12 a. m.	12 p. m.	8	Lay from 12 m. until morning on bar.
Wood Pile.....	Aug. 22.....	4 a. m.	7 a. m.	13	All day at bar opposite Butte.
Round Butte Bar.....	Aug. 23.....	7 a. m.	6 p. m.	2	Sounding below Milk river.
Bar opposite Butte.....	Aug. 24.....	4 a. m.	4.30 p. m.	7	Two sparring and two wooding.
Two miles below Milk River.....	Aug. 25.....	5 a. m.	4.30 p. m.	3	Wind
Fort Charles.....	Aug. 26.....	5 a. m.	6.30 p. m.	.....	Delayed by wind.
.....	Aug. 27.....	5 a. m.	9 p. m.	6.30	By wind.
Fort Buford.....	Aug. 28.....	8 a. m.	8 p. m.	3	Bars and wooding.
Below Muddy River.....	Aug. 29.....	4 a. m.	12 p. m.	6	At Berthold.
Lodi Creek.....	Aug. 30.....	4 a. m.	7 p. m.	1	Tied up for wind.
Fort Berthold.....	Aug. 30.....	6 p. m.	8.30 a. m.	2.30	At Stevenson's.
Below Fort Berthold.....	Aug. 31.....	4 a. m.	.....	.....	

Fort Slawson.....	Aug. 31.....	11	a. m.	4	3.30	p. m.	4	2.30	Wooding.
Below Big Knife River.....	Sept. 1.....	5	a. m.	4	3.30	p. m.	1	1	At Fort Rice.
Fort Rice.....	Sept. 1.....	5	p. m.	4	3.30	p. m.	1	1	Wooded below Cannon Ball.
Below Cannon Ball.....	Sept. 2.....	5	a. m.	4	3.30	p. m.	1	1	By wind.
Above Grand River.....	Sept. 3.....	5	a. m.	7	7	p. m.	1	1	Taking false channel.
Above Big Cheyenne.....	Sept. 4.....	5	a. m.	9	12	p. m.	2	2	Thirty miles in seventeen hours; cause, bars.
Big Cheyenne.....	Sept. 4.....	12	a. m.	9	12	p. m.	2	2	At New Fort Sully.
Below Fort Sully.....	Sept. 4.....	2	p. m.	7	7	p. m.	6	6	Wooded and tied up for night.
Anque Bongar Island.....	Sept. 5.....	5	a. m.	7	7	p. m.	6	6	By bars passing Old Sully.
Old Fort Sully.....	Sept. 5.....	5	a. m.	7	7	p. m.	6	6	Made fifteen miles during the day; cause, wind.
Below Fort Sully.....	Sept. 6.....	6	p. m.	7	7	p. m.	13	13	Made fifteen miles; wind.
Below Fort Sully.....	Sept. 7.....	6	p. m.	7	7	p. m.	7	7	Wind.
Below Fort Sully.....	Sept. 8.....	4	p. m.	9	9	p. m.	1	1	Wooded during night.
Above Fort Thompson.....	Sept. 8.....	5	a. m.	9	9	p. m.	1	1	Stopping at Randall.
Opposite Corn Creek.....	Sept. 9.....	7	a. m.	8	8	p. m.	6	6	Aground on bar opposite Randall.
Fort Randall.....	Sept. 9.....	12	p. m.	8	8	p. m.	3.30	3.30	Four on bar at Lower Butte, and two Randall bar.
Opposite Fort Randall.....	Sept. 10.....	5.30	p. m.	8	8	p. m.	3.30	3.30	Yancton Agency; wind.
Lower Butte.....	Sept. 10.....	5	a. m.	8	8	p. m.	3.30	3.30	
Yancton Agency.....	Sept. 10.....	5	a. m.	8	8	p. m.	3.30	3.30	
Nioborn.....	Sept. 11.....	5	a. m.	8	8	p. m.	3.30	3.30	Vermillion during night.
Vermillion.....	Sept. 11.....	5	a. m.	8	8	p. m.	3.30	3.30	At Sioux City.
Sioux City.....	Sept. 12.....	3	p. m.	7	7	p. m.	3.30	3.30	By snags in bend.
Below Sioux City.....	Sept. 12.....	5	a. m.	8	8	p. m.	3.30	3.30	
Oma's.....	Sept. 13.....	11	a. m.	1	1	p. m.	12	12	Six at Omaha, and six for wind at St. Mary's.
St. Mary's.....	Sept. 14.....	11	a. m.	1	1	p. m.	14	14	All day for wind.
St. Mary's.....	Sept. 15.....	11	a. m.	1	1	p. m.	14	14	All day for wind.
St. Mary's.....	Sept. 16.....	11	a. m.	1	1	p. m.	3	3	At Nemaha for wind.
Nemaha.....	Sept. 17.....	6	a. m.	7	7	p. m.	3	3	
Below Nemaha.....	Sept. 17.....	4	p. m.	7	7	p. m.	3	3	
St. Joseph.....	Sept. 18.....	5	a. m.	5.30	5.30	p. m.	3	3	Over night at St. Joseph.
Below Liberty.....	Sept. 19.....	5	a. m.	7	7	p. m.	3	3	Night at wood yard, below Liberty.
Slaughter House Island.....	Sept. 20.....	5	a. m.	7	7	p. m.	3	3	Night at Slaughter House island.
Pinkney.....	Sept. 21.....	8	a. m.	8	8	p. m.	3	3	By foggy morning.
St. Charles.....	Sept. 22.....	8	a. m.	1.30	1.30	p. m.	3	3	
	Sept. 22.....	10.30	p. m.	5.30	5.30	p. m.	3	3	Arrived at St. Louis.

LIST OF OBSTRUCTIONS.

Partial list of snags and wrecks in the lower section of the Missouri river, beginning at Fort Randall, Dakota Territory.

Place.	Shore.	No.	Remarks.
Fort Randall.....			
To Tower Butte.....	Left.....	6	
To Yanton agency.....	Left.....	20	
To Nioborn.....	Right.....	13	
Bend below Nioborn.....	Left.....	5	
Bend above Bonhomme.....	Right.....	8	Cutting into timber.
To Yanton.....	Right.....	15	Timbered along Bonhomme island.
First bend below Yanton.....	Left.....	25	Snag cluster troublesome, cutting into timber.
To Dakota river.....	Left.....	11	Cutting on left into timber.
To Bow river.....	Left.....	19	Cutting on left into timber.
To Tide creek.....	Left.....	30	Cutting on left into timber.
To Vermillion.....	Right.....	6	Cutting into timber.
Vermillion bend.....	Left.....	13	Cutting into timber.
First bend below Vermillion bend.....	Right.....	4	
Second bend below Vermillion bend.....	Left.....	15	Cutting timbered bank.
Deer Fort bend.....	Right.....	3	
First bend below Deer Fort bend.....	Left.....	21	Cutting timbered bank.
To Ponka.....		10	
First bend below Ponka.....	Right.....	6	
Second bend below Ponka.....	Left.....	15	Cutting timbered bank.
Third bend below Ponka.....	Right.....	8	Cutting timbered bank.
Fourth bend below Ponka.....	Left.....	5	Cutting timbered bank.
Fifth bend below Ponka.....	Right.....	12	Cutting timbered bank.
Sioux City cut-off.....	Right.....	18	
Sioux City.....	Left.....	3	
Below Floyd river.....	Right.....	5	Cluster.
Head of Willow bar.....	Right.....	8	Cluster.
Foot of Willow bar.....	Right.....	6	Cluster.
Head of first bend.....	Right.....	15	Cluster in narrow channel very troublesome.
Second head of first bend.....	Channel.....	6	Channel unnatural and shifting.
Island, third head of first bend.....	Right.....	7	Cutting timbered banks.
Island, fifth head of first bend.....	Right.....	9	Blackbird hills cutting timbered banks
Island, sixth head of first bend.....	Left.....	10	Cutting into timber.
Island, seventh head of first bend.....	Right.....	5	Cutting to timber on left.
Island, eighth head of first bend.....	Left.....	3	Cutting to timber on left.
Island, ninth head of first bend.....	Right.....	12	Cutting to timber on left.
Tenth head of first bend.....	Left.....		Cutting into prairie.
Eleventh head of first bend.....	Right.....	9	In upper part of bend timbered.
Twelfth head of first bend.....	Left.....	21	Close cluster across channel; sunk steamer.
Thirteenth head of first bend.....	Right.....	6	Upper half of bend.
Fourteenth head of first bend.....	Left.....	25	Close cluster across channel; Mariner sunk.
Fifteenth head of first bend.....	Right.....		Cutting into prairie.
Above Little Sioux river.....	Left.....	10	Cutting into timber.
Above Little Sioux river.....	Right.....	15	Cutting into timber.
Below Little Sioux river.....	Left.....	13	Cutting into timber.
Below first bend.....	Right.....	12	Cutting into timber.
Below second bend.....	Left.....	10	Cutting into timber.
Below third bend.....	Right.....	7	Cutting into prairie and willows.
Below fourth bend.....	Left.....	23	Cutting into timber, bad place.
Bend above cut-off.....	Right.....	2	Cutting into willows.
Cut-off.....	Left.....	9	Cutting into willows and timber.
Below cut-off.....	Left.....	10	Will be entirely changed next year.
Bend above De Soto.....	Left.....	10	Cutting into timber very rapidly, 600 feet in two months.

List of obstructions, &c.—Continued.

Place.	Shore.	No.	Remarks.
De Soto bend.....	Right.....	2	
Bend below De Soto bend.....	Right.....	10	Cutting into timber cluster.
Fort Calhoun.....	Right.....	1	Cutting into timber cluster.
To Florence.....			
Bend below Florence.....	Left.....	4	
Bend above Omaha.....	Right.....		
First bend below Omaha.....	Left.....	3	
Second bend below Omaha.....	Right.....		
Third bend below Omaha.....	Left.....	8	
To St. Mary's cut-off.....		12	
Below St. Mary's cut-off.....	Right.....	7	
To Plattsmouth.....		16	
To Hillsboro landing.....		5	
Egypt wood yard.....	Left.....	4	
Kingston landing.....	Left.....	8	
Melville landing.....	Left.....	3	
Above Jones's Point.....	Right.....	2	
Below Jones's Point.....	Right.....	4	
Point below Jones's crossing.....	Right.....	30	Ought to be removed.
Above Wyoming.....	Right.....	40	Great number large.
Below Wyoming.....	Left.....	10	
Next bend below.....	Right.....	30	H. S. Turner sunk by one.
Bend above Nebraska City.....	Left.....	23	Mostly large.
First bend below Nebraska.....	Left.....	30	Channel cutting into woods.
First bend below Sidney landing.....		6	
Above cut-off.....	Right.....	5	
Above Kansas bend.....	Left.....	30	
Cut-off above Peru.....		6	
Peru bend.....		2	One head of bar, one above Tow head.
Brownsville.....		6	
Nemaha bend.....		6	Number in bank.
Opposite mouth of Nemaha.....		16	
Below mouth of Nemaha.....			Two breaks.
Below St. Stephen's.....	Left.....	5	
Above Rulo.....		4	Timbered bank.
Rulo bend.....		20	Old mouth of Nemaha.
Big Tarkio bend.....		10	
Below Big Tarkio bend.....		12	Across river.
Bend below Nemaha.....	Left.....	20	Chain between bar and sand point.
Forrest City landing.....		25	Timbered banks.
Iowa Point.....		8	
Below Iowa Point.....		3	
Above Lafayette.....	Left.....	11	
Crossing below Lafayette.....	Left.....	10	
Charleston bend.....	Right.....	7	
Arizona bend below.....	Right.....	13	
Arizona bend below.....	Left.....	8	
Arizona bend below.....	Right.....	6	No timber.
Next bend below.....	Right.....	9	Timbered.
Above St. Joseph.....	Left.....	15	
St. Joseph.....	Right.....	15	
St. Joseph.....		20	
To Alans.....		27	Little timber.
Alans bend.....	Right.....	2	
Below St. Joseph.....	Left.....	17	
Below Alans.....	Right.....	6	
Below St. Joseph.....	Left.....	30	Smith's bend.
Dauphin's bend.....		6	
Dauphin's bend.....	Left.....	24	Partly timbered.
Below Atchison.....	Left.....	7	
Bend below Atchison.....		6	Cutting into timber.
Second bend below Atchison.....	Left.....	3	

List of obstructions, &c.—Continued.

Place.	Shore.	No.	Remarks.
Kicapoo		5	
Weston		10	
Fort Leavenworth	Right	16	
Above Parkville	Right	18	
Quindaro	Right	10	
Above Wyandotte	Left	16	
Wyandotte bend	Right	3	Cutting away 100 yards in last four months.
Kansas City	Left	6	
Kansas City, below	Right	14	
Kansas City, below	Left	13	
Wayne City	Left	6	
Wayne City crossing		5	
Below Liberty landing	Left	10	
Below Liberty landing	Left	24	
Above Missouri City	Right	8	
Below Missouri City	Left	11	
Below Missouri City	Right	16	
Below Missouri City	Left	15	
Liberty bend	Right	10	
Napoleon	Right	5	
Below Napoleon	Left	20	Bend full of breaks.
Below Camden	Right	15	
Below Camden	Left	1	
Wellington	Right	12	
Monag's bend	Right	10	Timber.
Monag's bend	Right	20	
Monag's bend	Right	8	
Bend above Cambridge	Left	30	
Cambridge bend	Right	17	
Large island	Left	10	Wreck snagged.
Large island	Left	15	
Solina City bend	Right	11	Little Arrow Rock.
Lisbon	Left	8	
Arrow Rock	Right	10	Channel full of snags.
Franklin bend island	Left	40	
Franklin bend island	Right	1	
White's Point	Left	11	
Diana bend	Right	13	
Rockport bluff	Left	2	
Terrapin island		1	
Opposite Mount Vernon	Left	17	
Ploughboy bend	Right	8	
Providence bend		6	
Right shore bend	Right	11	
Providence bend	Left	6	
Sandy Hook	Right	30	
Below Sandy Hook		5	
Marion	Right	5	
Marion bend island		8	
Plaisville		20	
Jefferson City, above	Left	3	
Opposite Jefferson City	Left	3	
Jefferson City bend	Right	4	
Jefferson City, opposite island	Left	13	
Jefferson City, opposite island	Right	10	
Below Osage chute	Right	10	
St. Aubert island			Wreck of Robert Emmett.
Albert bend	Left	25	Wreck of Mollie Dozier in channel.
Portland bend	Left	1	Wreck of Lenora and Lancaster.
To Blufftown	Right	26	
Gasconade island	Right	18	Worst place in Iowa river; channel shifts from right to left of island.

List of obstructions, &c.—Continued.

Place.	Shore.	No.	Remarks.
To McGurk's island, mouth Gasconade river		9	
Below Herman	Right	1	
Brush island	Left	25	Rack heap.
Below Brush island			Large cluster across channel.
Chute above Pinkney		15	
Chute below Pinkney	Left	18	
Below Miller's landing	Right	10	
Emily bend		4	
Pohlman's landing	Left	3	
Below Pohlman's landing	Right	4	
Head of St. John's island		35	Full of snags and rack heaps.
Above Washington City	Left	40	Opposite St. John's island.
Above Augusta	Right	15	
Augusta bend	Right		Snaggy and shifting wrecks of Parker and Euton.
Murdock's Point	Right	7	Rack heaps.
Murdock's Point	Right	7	
Above Towhead	Left	12	
Goodwin coal banks	Right	15	
Lexington	Left	3	
Lexington	Right	8	
Lexington island	Right	19	
Below Shanghai	Left	18	
Below Shanghai	Left	14	
Above Waverly	Right	1	
Below Waverly	Right	7	
Opposite Crane	Right	5	
Below Crane	Left	8	
Malta bend	Right	13	
Below Malta bend	Left	15	
Below Malta bend	Right	20	
Kietsaw	Left	19	
Miami, above	Right	24	Timbered bank.
Miami, below	Right	3	Timbered bank.
Magenta bend	Left	30	Magenta sunk, 1863.
Brunswick	Right	9	
Brunswick above Grand river		40	
Brunswick below Brunswick	Right	52	
Below Brunswick	Left	1	
Buckhorn Point	Right	8	
Along bend	Right	17	
Bowling Green bend	Left	30	Heavy timber.
White Hall landing		9	
Momag's bend	Right	15	
Port Royal			Shaft of steamer Amaranth.
Dozier	Left	13	Cutting fast.
Dozier crossing		4	
Below Bonhomme island		2	
Howard's bend		15	
Howard's bend	Right	15	
Foot of St. Charles's island		8	
St. Charles	Right	12	
St. Charles's bend		13	
Chabonier island		8	Right chute.
Chabonier island		10	Left chute.
To Corcomas Point		2	
Pelican island	Right	12	
Brick House bend			Said to be bad.
Bell Fountain bluff		3	
Green island	Left	9	
Green island	Right	25	

GAUGE RECORDS.

Stage of the Missouri river from the 12th of July, 1867, to the 22d of September, 1867, from partial records kept during the second trip of the steamer Miner from Sioux City and return to St. Louis, Missouri.

From—		To—		Hours observed.	Rise.	Fall.	Estimate change to next station.		
							Running hours.	Rise.	Fall.
1867.	Hours.	1867.	Hours.		Feet.	Feet.		Feet.	Feet.
July 12...	12 p. m.	July 13...	3 a. m.	3	.04		19	.25	
13...	10 p. m.	14...	3 a. m.	5		.05	21		.21
14...	12 p. m.	15...	4 a. m.	4		.04	16		.16
15...	8 p. m.	16...	3 a. m.	7		.07	18		.18
16...	9 p. m.	17...	4 a. m.	7		.08	17		.20
17...	9 p. m.	18...	4 a. m.	7		.08	9		.10
18...	1 p. m.	19...	4 a. m.	15		.16	8		.08
19...	12 m.	25...	12 m.	24		.25	9		.08
20...	9 p. m.	21...	4 a. m.	7		.06	14		.12
21...	6 p. m.	22...	5 a. m.	11		.09	13		.10
22...	6 p. m.	23...	4 a. m.	10		.09	14		.12
23...	6 p. m.	24...	4 a. m.	10		.08	14		.11
24...	6 p. m.	25...	4 a. m.	10		.08	12		.10
25...	4 p. m.	26...	3.30 a. m.	11½		.07	14½		.08
26...	6 p. m.	27...	7 a. m.	13	.04		2	.01	
27...	9 p. m.	28...	4 a. m.	19	.06		15	.05	
28...	7 p. m.	29...	3.30 a. m.	8½	.06		14½	.12	
29...	6 p. m.	30...	3.30 a. m.	9½		.02	17½		.04
30...	9 a. m.	31...	3.30 a. m.	18½		.06	17½		.07
31...	9 p. m.	Aug. 1...	3.30 a. m.	6½		.03	17½		.09
Aug. 1...	9 p. m.	2...	4 a. m.	7		.03	11		.05
2...	3 p. m.	3...	3.30 a. m.	12½		.06	14		.08
3...	5.40 p. m.	4...	8.30 a. m.	15		.07	11½		.06
4...	8 p. m.	5...	4 a. m.	8	.04		16		.08
5...	8 p. m.	6...	6.30 a. m.	10½		.05	9½		.04
6...	4 p. m.	7...	4 a. m.	12		.05	15		.06
7...	7 p. m.	8...	4 a. m.	9	.04		15		.06
8...	7 p. m.	9...	4 a. m.	9	.04		17		.08
9...	9 p. m.	10...	4 a. m.	7	.03		16½		.07
10...	8.30 p. m.	11...	4 a. m.	7½	.03		17		.07
11...	9 p. m.	12...	4.30 a. m.	7½		.03	15½		.07
12...	8 p. m.	13...	4.30 a. m.	8½		.04	12½		.06
13...	5 p. m.	14...	6 a. m.	13	.08		9		.06
14...	3 p. m.	15...	7 a. m.	16	.10		12		.08
15...	7 p. m.	16...	5 a. m.	10	.08		3		.02
16...	8 p. m.	16...	7 p. m.	11	.09		1		.01
16...	8 p. m.	17...	4 a. m.	8	.06		3		.02
17...	7 a. m.	17...	12 m.	5	.04		1		.01
17...	1 p. m.	18...	10 a. m.	21	.20		3		.03
18...	1 p. m.	20...	7 a. m.	42	.35		13		.12
20...	8 p. m.	21...	4 a. m.	8	.05		12½		.07
21...	4.30 p. m.	22...	4 a. m.	11½	.05		8		.03
22...	12 m.	23...	4 a. m.	16	.04		3		.01
23...	7 a. m.	24...	4 a. m.	21	.06		14		.04
24...	6 p. m.	25...	5 a. m.	11	.03		11½		.03
25...	4.30 p. m.	26...	5 a. m.	12½	.03		11½		.03
26...	4.30 p. m.	27...	5 a. m.	12½	.04		13½		.04
27...	6.30 p. m.	28...	8 a. m.	13½	.06		13		.07
28...	9 p. m.	29...	4 a. m.	7	.03		12		.05
29...	8 p. m.	30...	4 a. m.	8	.03		8		.03
30...	12 p. m.	31...	4 a. m.	16	.05		12		.04
31...	4 p. m.	Sept. 1...	5 a. m.	13	.04		14		.04

IMPROVEMENT OF MISSOURI RIVER.

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Stage of the Missouri river, &c.—Continued.

Date.		Hours observed.	Rise.	Fall.	Estimate change to next station.		
From—	To—				Running hours.	Rise.	Fall.
1867.	Hours.	1867.	Hours.	Feet.	Feet.	Feet.	Feet.
Sept. 1...	7 p. m.	Sept. 2....	5 a. m.	10	.03	11	.03
2...	4 p. m.	3....	5 a. m.	13	.05	14	.06
3...	7 p. m.	4....	5 a. m.	10	.04	14	.05
4...	7 p. m.	5....	5 a. m.	10	.03	14	.04
5...	7 p. m.	6....	9 a. m.	14	.08	10	.08
6...	7 p. m.	8....	5 a. m.	10	.07	4	.03
8...	9 a. m.	8....	4 p. m.	7	.05	5	.04
8...	9 p. m.	9....	5 a. m.	8	.05	14	.07
9...	7 p. m.	10....	7 a. m.	12	.01	13	.12
10...	8 p. m.	11....	5 a. m.	9	.10	15	.18
11...	8 p. m.	12....	6 a. m.	10	.11	13	.12
12...	7 p. m.	13....	5 a. m.	10	.08	15	.11
13...	8 p. m.	14....	11 a. m.	15	.10	2	.02
14...	1 p. m.	15....	6 a. m.	17	.15	0	.00
15...	6 a. m.	16....	6 a. m.	24	.26	0	.00
16...	6 a. m.	17....	6 a. m.	24	.22	13	.12
17...	7 p. m.	18....	5 a. m.	10	.08	12½	.10
18...	5.30 p. m.	19....	5 a. m.	11½	.10	14	.12
19...	7 p. m.	20....	5 a. m.	10	.08	14	.11
20...	7 p. m.	21....	8 a. m.	13	.08	12	.07
21...	8 p. m.	22....	8 a. m.	12	.08	9½	.06
22...	5.30 p. m.	23....	5 a. m.	11½	.08	.....	.....

TIME OF TRIP.

	Hours.
From St. Louis to Sioux City.....	212
From Sioux City to Dauphin rapids and return to St. Louis.....	1,698
Total, round trip.....	1,910

RUNNING TIME.

	Hours.
From Sioux City to Dauphin's and return to St. Louis.....	850
Delays from Sioux City to Dauphin's and return to St. Louis.....	848

FALL OF RIVER.

	Feet.
From 12th of July to 23d of September, record of trip.....	9.73
From 12th of July to 23d of September, St. Louis record.....	18.48
From 14th of August to 31st of August, record of trip.....	1.60
From 14th of August to 31st of August, Fort Rice record.....	2.54
From 14th of August to 31st of August, St. Louis record.....	4.39
From 1st of July to 30th of September, St. Louis record.....	16.27

Rise and fall of the Missouri river at Fort Rice, Dakota Territory, from August 14, 1867, to August 31, 1867, recorded by First Lieutenant W. H. Reedy, 22d infantry, and acting assistant quartermaster.

Date.	Time.	Rise.	Fall.
August 14, 1867.....	Night.....		.08
15, 1867.....	do.....		.12
16, 1867.....	Day.....		.08
16, 1867.....	Night.....		.12
17, 1867.....	Day.....		.12
17, 1867.....	Night.....		.12
18, 1867.....	Day.....	.08	
18, 1867.....	Night.....		.06
19, 1867.....	Day.....		.06
20, 1867.....	Night.....		.08
21, 1867.....	Day.....		.00
21, 1866.....	Night.....		.12
22, 1867.....	Day.....		.00
22, 1867.....	Night.....		.00
23, 1867.....	Day.....		.12
23, 1867.....	Night.....		.12
24, 1867.....	Day.....		.08
24, 1867.....	Night.....		.08
25, 1867.....	Day.....		.16
25, 1867.....	Night.....		.16
26, 1867.....	Day.....		.08
26, 1867.....	Night.....		.12
27, 1867.....	Day.....		.08
27, 1867.....	Night.....		.08
28, 1867.....	Day and night.....		.17
29, 1867.....	do.....		1.00
30, 1867.....	do.....		.16
31, 1867.....	do.....		.00

Stage of the Mississippi river at St. Louis, Missouri, during the months of July, August, and September, 1867, from the official records of the engineer of the city of St. Louis.

Date.	Above low water of 1863.	Below high water of 1864.	Below city directrix.	Rise.	Fall.
			<i>Fest.</i>	<i>Fest.</i>	<i>Fest.</i>
July 1, 1867.....	24.52	16.87	9.29	0.48	
2, 1867.....	24.64	16.75	9.17	.12	
3, 1867.....	24.73	16.66	9.08	.09	
4, 1867.....				.69	
5, 1867.....	25.42	15.97	8.39	.47	
6, 1867.....	25.89	15.50	7.92		
7, 1867.....					
8, 1867.....	26.39	15.00	7.42	.50	
9, 1867.....	26.81	14.58	7.00	.42	
10, 1867.....	26.71	14.64	7.10		0.10
11, 1867.....	26.75	14.64	7.06	.04	
12, 1867.....	26.29	15.10	7.52		0.46
13, 1867.....	26.25	15.14	7.56		.04
14, 1867.....					
15, 1867.....	25.93	15.46	7.86		.32
16, 1867.....	25.89	15.50	7.92		0.4
17, 1867.....	26.39	15.00	7.42	.50	
18, 1867.....	26.66	14.73	7.15	.27	
19, 1867.....	26.27	15.12	7.54		.39

Stage of the Mississippi river at St. Louis, Missouri, &c.—Continued.

Date.		Above low water of 1863	Below high water of 1864.	Below city directrix.	Rise.	Fall.
				<i>Fect.</i>	<i>Fect.</i>	<i>Fect.</i>
July	20, 1867	25.31	16.08	8.50		.96
	21, 1867					
	22, 1867	24.31	17.08	9.50		1.00
	23, 1867	23.64	17.75	10.17		.67
	24, 1867	23.14	18.25	10.67		.50
	25, 1867	22.48	18.91	11.33		.66
	26, 1867	22.21	19.18	11.60		.27
	27, 1867	21.02	20.37	12.79		.19
	28, 1867					
	29, 1867	21.10	20.29	12.71	.08	
	30, 1867	20.21	21.18	13.60		.89
	31, 1867					
August	1, 1867	19.94	21.46	13.87		.27
	2, 1867	19.75	21.64	14.06		.19
	3, 1867	19.44	21.95	14.37		.31
	4, 1867					
	5, 1867	19.00	22.39	14.81		.44
	6, 1867	18.50	22.89	15.31		.50
	7, 1867	18.04	23.35	15.77		.46
	8, 1867	17.54	23.85	16.27		.50
	9, 1867	17.50	23.89	16.31		.04
	10, 1867	17.31	24.08	16.50		.19
	11, 1867					
	12, 1867	17.00	24.30	16.81		.31
	13, 1867	16.92	24.47	16.89		.08
	14, 1867	16.87	24.52	16.94		.05
	15, 1867	16.71	24.68	17.10		.16
	16, 1867	16.61	21.78	17.20		.10
	17, 1867	16.39	25.00	17.42		0.22
	18, 1867					
	19, 1867	15.79	25.60	18.02		.60
	20, 1867	15.54	25.85	18.27		.25
	21, 1867	15.31	26.08	18.50		.23
	22, 1867	14.96	26.43	18.85		.35
	23, 1867	14.58	26.81	19.23		.38
	24, 1867	14.23	27.16	19.58		.35
	25, 1867					
	26, 1867	13.71	27.68	20.10		.52
	27, 1867	13.39	28.00	20.42		.32
	28, 1867	13.25	28.14	20.56		.14
	29, 1867	13.04	28.35	20.77		.21
	30, 1867	12.60	28.70	21.12		.35
	31, 1867	12.48	28.91	21.33		.21
September 1, 1867						
	2, 1867	12.44	29.95	21.37		.04
	3, 1867	12.27	29.12	21.54		.17
	4, 1867	12.00	29.39	21.81		.27
	5, 1867	11.67	29.72	22.14		.33
	6, 1867	11.35	30.04	22.46		.32
	7, 1867	11.02	30.37	22.79		.33
	8, 1867					
	9, 1867	10.73	30.66	23.08		.29
	10, 1867	10.56	30.83	23.25		.17
	11, 1867	10.33	31.06	23.48		.23
	12, 1867	10.08	31.31	23.73		.25
	13, 1867	9.85	31.54	23.96		.23
	14, 1867	9.56	31.83	23.25		.29
	15, 1867					
	16, 1867	9.00	32.39	24.81		.56
	17, 1867	8.77	32.62	25.04		.23
	18, 1867	8.56	32.83	25.25		.21

Stage of the Mississippi river at St Louis, Missouri, &c.—Continued.

Date.	Above low water of 1863.	Below high water of 1864.	Below city directrix.	Rise.	Fall.
			<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
September 19, 1867.....	8.39	33.00	25.42		.17
20, 1867.....	8.23	33.16	25.58		.16
21, 1867.....	8.06	33.33	25.75		.17
22, 1867.....					
23, 1867.....	7.81	33.58	26.00		.25
24, 1867.....	7.77	33.62	26.04		.04
25, 1867.....					
26, 1867.....					
27, 1867.....	7.73	33.66	26.08		.04
28, 1867.....	8.50	32.89	25.31	.77	
29, 1867.....					
30, 1867.....	8.25	33.14	25.56		.25

COMMERCIAL STATISTICS

Arrivals and departures of steamers at St. Louis to and from Missouri river.

Arrived.	Number.	Departed.	Number.
January.....		January.....	
February.....	2	February.....	5
March.....	12	March.....	29
April.....	35	April.....	56
May.....	28	May.....	59
June.....	44	June.....	31
July.....	46	July.....	32
August.....	40	August.....	41
September.....	33	September.....	33
Total.....	240	Total.....	286

Partial list of accidents to the Missouri river fleet for the season of 1867.

Steamer.	Accidents.
David Watts.....	Struck a heavy log and returned to St. Louis for repairs.
J. H. Trover.....	Grounded at Point Au Poche, and proved a total loss; cargo saved.
Nora.....	Sunk near De Sota; boat and cargo lost.
Deer Lodge.....	On second trip broke her shaft near Decatur and returned to St. Louis.
Amaranth.....	Broke her shaft at De Sota and returned to St. Louis.
Last Chance.....	Met with accident at Little Sioux and returned to St. Louis.
H. S. Turner.....	Sunk by snag below Wyoming.
Amelia Poe.....	Snagged and sunk at Gasconade island.
Unknown.....	Wrecked in Peru cut-off.
Imperial.....	On her return caught by low water at Milk river, and will probably be lost; arrived at St. Joseph, Missouri, safe.
Waverly.....	Snagged and sunk in Bowling Green Bend, Nov. 24, 1867; total loss.
Viola Belle.....	Sunk at Lisbon Landing, November 26, 1867.
Zephyr.....	Last reported aground near Milk river.

Statement of steamers that left St. Louis for Fort Benton and the upper Missouri, with the date of arrival at destination, with tons of freight taken up, and date of return to St. Louis.

Boat.	Left St. Louis.	Arrived at—	Date.	Tons freight.	Returned.
	1867.		1867.		1867.
Amelia Poe	March 28	Fort Benton	June 9	184	June 25.
Only Chance	28	do.	1	185	16.
Ben. Johnson	29	do.	14	265	July 4.
Yancton	30	do.	11	210	June 30.
W. B. Dance	30	do.	3	198	21.
Waverly	31	do.	May 25	160	16.
Huntsville	31	do.	June 14	190	
Miner	April 1	do.	May 31	150	17.
Mountaineer	3	do.	June 10	330	25.
Amaranth	4	do.	30	225	July 18.
Deer Lodge	6	do.	2	208	June 17.
Cora	6	do.	3	210	16.
Antelope	9	do.	July 3	270	
St. John's	10	do.	June 11	129	June 25.
Guidon	11	do.	20	225	Sept. 5.
Big Horn	12	do.	July 8	218	
Benton	12	do.	June 20	200	July 11.
Nymph, No. 2	12	do.	do.	150	
Nile	13	do.	June 12	150	June 28.
J. H. Trover	13	Muscle Shell	do.	200	Dismantled.
Abcona	16	Fort Benton	July 4	230	
Lilly	18	do.	8	242	
Dora	18	do.	do.	150	
Ida Stockdale	18	do.	June 18	250	
Gallatin	20	do.	do.	250	
Jennie Brown	20	do.	do.	125	
Carrie	20	Fort Buford	June 12	250	June 25.
Marcella	23	Fort Rice	5	300	16.
G. A. Thompson	23	Fort Benton	30	200	July 18.
Viola Belle	23	do.	July 23	170	
Tacony	24	do.	5	180	26.
Luella	25	do.	8	129	
G. W. Graham	26	Fort Buford	June 26	300	8.
Agnes	27	Fort Benton	July 5	160	26.
Ned Tracy	27	Fort Berthold	June 21	400	1.
G. B. Allen	May 1	Fort Rice	7	400	June 16.
Little Rock	1	Fort Benton	July 14	165	
Cornelia	3	Fort Berthold	June 13	450	24.
Lady Grace	5	Fort Benton	July 11	234	
Lexington	7	Fort Sully	June 20	522	30.
Silver Lake, No. 4	7	Fort Benton	July 16	350	
Richmond	8	do.	27	270	
Tom Stevens	11	do.	10	100	
Octavia	11	do.	June 20	190	July 8.
Ida Fulton	11	do.	July 16	175	
Nora	14	do.	Sunk	do.	
Imperial	17	Cow Island	Aug. 11	225	
Evening Star	18	Fort Berthold	June 22	300	June 30.
Paragon	18	Fort Buford	July 1	400	July 10.
Dictator	22	Fort Sully	June 16	182	26.
Zephyr	23	Fort Benton	do.	150	
Mary McDonald	25	Fort Berthold	June 28	452	July 7.
City of Pekin	25	Fort Union	July 5	295	
T. L. McGill	28	Fort Berthold	8	430	
Jessie Lewis	31	Fort Sully	June 19	400	June 25.
Centralia	June 12	Fort Hawley	Aug. 23	225	Sept. 27.
Last Chance	18	do.	do.	175	
Miner	29	Cow Island	Aug. 13	160	22.

IMPROVEMENT OF MISSOURI RIVER

Statement of departure and arrival of steamers, &c.—Continued.

Boat.	Left St. Louis.	Arrived at—	Date.	Tons freight.	Returned.
	1867.		1867.		1867.
Carrie	July 2	Fort Buford	Aug. 7	223	
Huntaville	3	Fort Benton		250	
Mountain	3	Fort Berthold	Aug. 7	360	Sept. 16.
Only Chance	4	Fort Benton	29	185	
Deer Lodge	29	Fort Buford	24	150	
St. John's	Aug. 9	Plum island	29	No fr't.	
Mary McDonald	10	Fort Berthold	Sept. 3	225	
Benton	29	.....		200	
Amaranth	Sept. 3	.....		225	
Lady Grace	3	Fort Berthold		225	
Amelia Poe	7	Fort Rice		180	
W. B. Dance	7	.....		190	
Mountaineer	24	.....		300	

Statement of shipments from St. Louis, Missouri, up the Missouri river, from January 1 to October 1, 1867.

Articles.	Quantity.	Articles.	Quantity.
Apples..... barrels..	862	Liquor..... boxes..	7,719
Ale and beer..... kegs..	1,252	Leather..... rolls..	1,447
Bacon..... casks..	766	Lumber..... feet..	16,380
Bacon..... packages..	15,556	Malt..... sacks..	2,008
Bran..... sacks..	311	Molasses..... barrels..	1,343
Barley..... sacks..	357	Molasses..... half barrels..	1,507
Beans..... sacks and barrels..	2,043	Molasses..... kegs..	5,350
Brooms..... bundles..	2,379	Nails..... kegs..	31,082
Butter..... packages..	551	Ons..... bushels..	141,627
Cement..... barrels..	5,289	Onions..... packages..	263
Coffee..... sacks..	10,211	Oil..... barrels..	4,643
Corn-meal..... barrels..	793	Paper..... bundles..	5,710
Crackers..... packages..	10,698	Potatoes..... sacks and barrels..	7,976
Cattle..... head..	62	Pork..... barrels..	1,412
Cheese..... boxes..	3,292	Pork..... packages..	227
Corn..... sacks..	33,155	Railroad iron..... bars..	18,149
Cotton yarn..... packages..	1,314	Rope..... coils..	2,385
Dry fruit..... sacks and barrels..	2,690	Salt..... sacks..	4,064
Flour..... barrels..	20,860	Salt..... barrels..	33,634
Gunnies..... bales..	925	Seed..... sacks and barrels..	1,730
Gunnies..... bundles..	2,007	Sugar..... hogsheads..	164
Groceries..... packages..	129,875	Sugar..... barrels..	12,184
Glassware..... do..	15,794	Sugar..... boxes..	592
Glass..... boxes..	8,761	Sugar..... bags..	12,945
Hay..... bales..	507	Shingles..... M..	8,496
Hair..... sacks..	1,852	Sundries..... packages..	388,000
Hardware..... packages..	45,718	Tobacco, (manu'd)..... packages..	12,001
Iron..... tons..	1,324	Vinegar..... barrels..	2,227
Iron..... bundles..	8,266	Wheat..... sacks..	243
Iron..... pieces..	12,875	Whiskey..... barrels..	5,170
Lard..... packages..	1,419	White lead..... kegs..	3,787
Lime..... barrels..	607	Wine..... barrels..	267
Liquor..... barrels..	1,928	Wine..... boxes..	3,770

GEO. H. MORGAN,

Sec'y U. Mer. Ez., St. Louis, Missouri.

Statement of receipts at the port of St. Louis, from the Missouri river, from January 1 to October 1 1867.

Articles.	Quantity.	Articles.	Quantity.
Wheat..... bushels..	391,734	Bacon..... casks and boxes..	2,093
Corn..... do.....	325,060	Bacon..... packages..	10,551
Oats..... do.....	94,305	Apples..... barrels..	1,000
Rye..... do.....	8,068	Alcohol..... do.....	141
Barley..... do.....	7,460	Hran..... sacks..	975
Flour..... barrels..	2,870	Dried fruit..... do.....	808
Tobacco..... hogheads..	7,711	Pork..... barrels..	235
Tobacco..... boxes..	1,743	Pork..... packages..	18,318
Hemp and tow..... bales..	21,477	Rags..... bales..	508
Lard..... packages..	1,742	Seeds..... sacks..	882
Lard..... kegs.....	674	Tallow..... bales..	354
Furs..... packages..	3,272	Whiskey..... barrels..	133
Peltries..... do.....	1,379	Cattle..... head.....	3,592
Wool..... bales and packages..	2,247	Hogs..... do.....	8,487
Hides..... number.....	11,694	Sheep..... do.....	2,756
Hides..... bundles..	829	Sundries..... packages..	8,946
Grease..... barrels..	215		

GEO. H. MORGAN,
Sec'y U. Mer. Exchange.

List of government freight shipped up the Missouri river by Brevet Lieutenant Colonel C. W. Thomas, quartermaster United States army at St. Louis, Missouri.

Date.	Name of steamer.	Destination.	Pounds weight.	Horses.	Mules.	Ambulances.	Wagons.
March 25	Yellowstone	Fort Leavenworth	180,120				
29	Sam Gaty	Omaha	353,513				
30	G. B. Allen	Fort Leavenworth	38,593				
April 3	Mary McDonald	Omaha	20,018				
3	H. S. Turner	Fort Leavenworth	4,097				
4	Mary McDonald	do	200				
10	War Eagle	Omaha	72,242				
10	Yellowstone	Fort Leavenworth	32,996				
11	Jennie Lewis	Omaha	535,344	72			
10	St. John	Fort Sally	2,000				
10	do	Fort Buford	220				
10	do	Fort Benton	188,856				12
10	do	Camp Cooke	57,844				
12	Big Horn	Fort Benton	298,375				12
12	do	Camp Cooke	28,440				
13	H. S. Turner	do	18,293				4
13	do	Fort Benton	384,873				12 12
12	Benton	do	20,494				
12	do	Camp Cooke	297,536				
10	Jennie Lewis	Omaha	123				
13	Columbia	do	80,827				
17	Abeona	Fort Benton				1	

List of government freight shipped up the Missouri river, &c.—Continued.

Date.	Name of steamer.	Destination.	Pounds weight.	Horses.	Males.	Ambulances.	Wagons.
April	17 Abeona	Camp Cooke	142,675				6
	18 Ida Stockdale	Fort Buford	100,000				
	18 G. B. Allen	Fort Leavenworth	22,628				
	18 Lilly	Fort Benton	105,247		33		2
	18 ..do	Camp Cooke	186,742				
	18 ..do	Fort Buford	39,569				
	20 W. J. Lewis	Omaha	465,952				
	20 ..do	Fort Leavenworth	4,440				
	22 Carrie	Fort Buford	434,233				
	20 Gallatin	Camp Cooke	24,085		20		
	22 G. A. Thompson	do	130,516				10
	22 ..do	Fort Benton	70,338		32	3	
	25 Marcella	Fort Randall	212,715				
	25 ..do	Yucoton	86,899				
	25 ..do	Omaha	16,900				
	25 Luella	Camp Cooke	99,127				
	25 ..do	Fort Buford	35,838				
	20 Lilly	Fort Benton	48,510				
	25 Silver Lake No. 4	Camp Cooke	82,100				
	26 G. W. Graham	Fort Sully	540,047				
	27 Ned Tracy	Fort Rice	241,642				
	27 ..do	Fort Berthold	410,200		78		13
	27 Yellowstone	Fort Leavenworth	124,648				
	27 Kate Kinney	Omaha	81,963				
May	1 G. B. Allen	Fort Rice	750,368				
	1 Glasgow	Fort Leavenworth	3,246				
	4 War Eagle	do	64,000				
	3 Cornelia	Fort Berthold	679,190				
	4 Lady Grace	Fort Buford	161,660				
	6 War Eagle	Omaha	372,976				
	7 Sam Gaty	Fort Leavenworth	72,500				
	7 Lexington	Fort Sully	616,899				
	7 ..do	Fort Randall	64,249				
	7 ..do	Yancton	361,617				
	7 Silver Lake No. 4	Camp Cooke	324,037				
	7 ..do	Fort Buford	29,880				
	4 Lady Grace	Fort Benton	155,109				
	6 War Eagle	Omaha	4,668				
	8 Richmond	Fort Buford	65,668				
	8 ..do	Camp Cooke	130,000				
	8 ..do	Fort Benton	100,000				
	8 H. S. Turner	Fort Leavenworth	142,976				
	8 ..do	Omaha	8,087				
	11 Yellowstone	Fort Leavenworth	274,093				
	11 Ida Fulton	Fort Benton	82,065				
	11 ..do	Camp Cooke	113,403				
	12 Tom Stevens	do	5,008				
	12 ..do	Fort Benton	148,708				
	14 Nora	Fort Sully	4,992				
	14 ..do	Fort Benton	175,000				
	14 ..do	Fort Berthold	3,284				
	14 ..do	Camp Cooke	134,349				
	14 Imperial	Fort Berthold	4,476				
	14 ..do	Fort Benton	234,685				
	14 ..do	Fort Buford	8,692				
	14 ..do	Camp Cooke	109,111				
	18 Montana	Omaha	109,413				
	18 Paragon	Fort Buford	309,982				
	18 ..do	Fort Berthold	261,845				

List of government freight shipped up the Missouri river, &c.—Continued.

Date.	Name of steamer.	Destination.	Pounds weight.	Horses.	Mules.	Ambulances.	Wagons.
18	Paragon	Fort Rice	108,139				
18	do	Fort Sully	119,793				
18	Montana	Fort Leavenworth				5	
18	Evening Star	Fort Berthold	407,270				
18	do	Fort Rice	100,643				
25	Zephyr	Camp Cooke	690				
22	Dictator	Fort Sully	377,585				
23	Zephyr	Fort Benton	130,000				
20	Glasgow	Omaha	59,768				
24	Yellowstone	Fort Leavenworth	92,026				
25	Mary McDonald	Fort Berthold	678,888				
25	do	Fort Rice	72,050				
18	Montana	Omaha	1,450				
25	City of Pekin	Fort Buford	553,424				
25	Columbian	Omaha	214,623				
25	T. L. McGill	Fort Sully	104,487				
28	do	Fort Berthold	730,125				
28	H. S. Turner	Omaha	106,069				
31	Jennie Lewis	Yancton	21,938				
31	do	Fort Randall	5,176				
31	do	Fort Sully	707,839				
28	H. S. Turner	Omaha	600				
1	W. J. Lewis	Fort Leavenworth	3,112				
4	Stonewall	Omaha	307,271				
4	do	Fort Leavenworth	752				
7	Isabella	do	18,713				
6	War Eagle	Omaha	23,080				
6	Montana	Fort Leavenworth	2,464				
6	do	Omaha	301,954				
12	Glasgow	do	291,361				
12	W. J. Lewis	Fort Leavenworth	24,862				
14	Columbian	Omaha	47,076				
17	Last Chance	Fort Sully	5,084				
17	do	Fort Rice	104,591				
17	do	Fort Berthold	86,554				
17	do	Fort Buford	27,885				
18	Kate Kinney	Omaha	257,918				
19	Isabella	do	171,144				
22	Stonewall	do	789,933				
24	Deer Lodge	Camp Cooke	102,644				
22	W. J. Lewis	Fort Leavenworth	8,554				
24	Deer Lodge	Fort Benton	59,735				
25	Montana	Omaha	496,339				
26	H. S. Turner	do	435,116				
26	do	Fort Leavenworth	8,681				
30	Cornelia	Omaha	170,319				
3	Mountaineer	Fort Berthold	227,605				
3	do	Fort Rice	390,097				
3	do	Fort Sully	7,656			2	
3	do	Fort Randall	7,644				
3	do	Yancton	25				1
2	Carrie	Fort Sully	83,822				
2	do	Fort Buford	400,217				
4	Only Chance	Fort Sully	50,340				
4	do	Fort Rice	104,450				
4	do	Fort Buford	4,340				
3	W. J. Lewis	Fort Leavenworth	137				
5	Kate Kinney	Omaha	14,875				
6	Huntsville	Fort Benton	2				
6	do	Fort Rice	97,260				
6	do	Fort Berthold	2				

List of government freight shipped up the Missouri river, &c.—Continued.

Date.	Name of steamer.	Destination.	Pounds weight.	Horses.	Mules.	Ambulances.	Wagons.
July	6	Huntsville	Fort Sully	8			
	9	Columbian	Omaha	53,548			
	12	Stonewall	do	1,035			
	13	W. J. Lewis	Fort Leavenworth	107,127			
	16	H. S. Turner	do	1,710			
	16	do	Omaha	76,375			
	19	Glasgow	do	148,875			
	24	Kate Kinney	do	23,371			
	24	G. B. Allen	Fort Leavenworth	178,921			
	27	Columbian	Omaha	122,627			
	27	do	Fort Leavenworth	93,179			
	29	Deer Lodge	Fort Berthold	175,609			
	29	do	Fort Sully	13,380			
	29	do	Fort Rice	16,500			
	29	do	Yancton	7,636			
	31	H. S. Turner	Omaha	82,767			
	31	do	Fort Leavenworth	93,838			
August	1	Amaranth	Fort Rice	61,031			
	1	do	Fort Stevenson	251,600			
	8	Glasgow	Omaha		81		
	8	do	Fort Leavenworth	656	30		
	6	W. B. Dauce	do	88,064			
	6	do	Omaha	909			
	10	Mary McDonald	Fort Rice	3,773			
	10	do	Fort Sully	2,848			
	10	do	Fort Stevenson	240,648	120		20
	12	Montana	Omaha	61,799			
	12	do	Fort Leavenworth	202,919	1		
	13	G. B. Allen	do	73,347			
	14	W. J. Lewis	do	282,276			
	16	Kate Kinney	Omaha	14,344			
	16	do	Fort Leavenworth	163,616			
	22	H. S. Turner	do	243,256			
	20	Columbian	do	165,041			
	20	do	Omaha	2,354			
	22	H. S. Turner	do	158,402			
	24	W. J. Lewis	Fort Leavenworth	233,750			
	24	Ben Johnson	Omaha	147,521			
	26	Glasgow	do	268,639			
	29	G. B. Allen	Fort Leavenworth	142,011			
	21	Octavia	Omaha	107,740			
	21	do	Fort Leavenworth		1		
September	2	Lady Grace	Fort Stevenson	160,848			
	2	do	Fort Sully	50,288			
	4	W. J. Lewis	Fort Leavenworth	24,735			
	4	Cornelia	Omaha	193,689			
	7	Amelia Poe	Fort Randall	8,053			
	7	do	Fort Sully	30,402			
	7	do	Fort Rice	235,527			
	13	Sam Gaty	Omaha	225,071			
	14	G. B. Allen	do	247,773			
	14	do	Fort Leavenworth	5,995			
	19	Mountaineer	Fort Randall	99,589			
	20	Antelope	Omaha	22,884		15	6
	20	do	Fort Leavenworth	41,259			
	20	Deer Lodge	Omaha	42,670			
	20	do	Fort Leavenworth	12,135			
	21	Mountaineer	Yancton	35			
	20	Ben Johnson	Fort Leavenworth	6,636	8		
Total			27,914,077	82	394	26	70